

**LONGHORN ARMY  
AMMUNITION PLANT**

**KARNACK, TEXAS**

**ADMINISTRATIVE  
RECORD**

**VOLUME 2 of 7**

**Year - 2004**

**Bate Stamp Numbers  
032073 - 032504**

***Prepared for:***

**Department of the Army  
Longhorn Army Ammunition Plant**

**LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS  
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX**

**VOLUME 2 of 7**

**Year - 2004**

- A: Title: Meeting – Technical Review Committee (TRC) Meeting on the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas – Meeting held at the Groundwater Treatment Plant (GWTP) Army Office Trailer, Karnack, Texas  
Recipient: All Parties  
Date: 03 March 2004  
Bate Stamp: 032073 – 032110
- B: Title: Letter & Final Report - Final Technical Memorandum – Modeling Approach for Derivation of Soil and Groundwater Concentrations Protective of Surface Water and Sediment, for the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas  
Author: Praveen Srivastav, Deputy Project Manager / Technical Lead, Shaw Environmental & Infrastructure, Inc., Houston, Texas  
Recipient: Andy Obrochta, U.S. Army Corps of Engineers (USACE), Tulsa District  
Date: 26 March 2004  
Bate Stamp: 032111 – 032151
- C: Title: Meeting – Monthly Managers Meeting on the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas – Meeting held at EPA Region 6 Headquarters, Dallas, Texas  
Recipient: All Parties  
Date: 21 April 2004  
Bate Stamp: 032152 – 032183
- D: Title: Letter & Transfer Documents – Transfer of a portion of Property at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas  
Author of Letter: Regional Director, United States Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico  
Recipient: Craig E. Blair, Acting Director, Real Property Disposal Division, General Services Administration (GSA), Fort Worth, Texas  
Date: 13 May 2004  
Bate Stamp: 032184 – 032292
- E: Title: Meeting – Monthly Managers Meeting on the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas – Meeting held by phone conference, Tulsa, Oklahoma  
Recipient: All Parties  
Date: 19 May 2004  
Bate Stamp: 032293 – 032310



**LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS  
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX**

**VOLUME 2 of 7 (continued)**

**Year - 2004**

- F: Title: Letter & Final Report - Final Environmental Condition of Property I (ECOP) for the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas  
Author of Report: Shaw Environmental & Infrastructure, Inc., Houston, Texas  
Author of Letter: Rose M. Zeiler, Site Manager, LHAAP  
Recipient: Chris Villarreal, US Environmental Protection Agency (EPA), Dallas, Texas  
copied to: James Sher, TCEQ, Austin, Texas; Paul Cornes, USFWS, Region 2, Albuquerque, New Mexico; Paul Bruckwicki, USFWS, Caddo Lake NWR, Texas; Susan Trussell, USACE, Tulsa District; Cliff Murray, USACE, Tulsa District; Jeff Armstrong, AEC; June Ahrens, USACE, Fort Worth District  
Date: 20 May 2004  
Bate Stamp: 032311 - 032432
- G: Title: Meeting - Technical Review Committee (TRC) Meeting on the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas - Meeting held at the Groundwater Treatment Plant (GWTP) Army Office Trailer, Karnack, Texas  
Recipient: All Parties  
Date: 02 June 2004  
Bate Stamp: 032433 - 032485
- H: Title: Letter - Subject: Perchlorate Delineation Sampling (Feb. 2004) at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas  
Author: Cliff Murray, Technical Manager, HTRW Design Center, USACE, Tulsa District  
Recipient: Rose M. Zeiler, Site Manager, LHAAP  
Date: 14 June 2004  
Bate Stamp: 032486 - 032493
- I: Title: Letter - Subject: Forest Management Activities at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas  
Author: Mark Williams, US Department of the Interior, Fish and Wildlife Service, Broken Bow, Oklahoma  
Recipient: Rose M. Zeiler, Site Manager, LHAAP  
Date: 09 July 2004  
Bate Stamp: 032494 - 032504

**Longhorn Army Ammunition Plant, Technical Review Committee Meeting**  
**March 3, 2004, 1:00 PM**  
**Agenda**

MMRP sites kickoff  
Treatment plant update  
Status of review documents  
Transfer map  
Explosive risk burning  
Potential influence on municipal wells



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**Subject: Draft Minutes, Technical Review Committee/Monthly Managers Meeting,  
Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting: LHAAP**

**Date of Meeting: March 03, 2004, 2:00 – 5:00 PM**

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**Meeting Participants:**

**BRAC:** Rose M. Zeiler, Robin Mills

**USAEC:** Mark Albe

**USACE-Tulsa:** Andy Obrochta

**Shaw Environmental:** Praveen Srivastav, David Tester, Frank Eidson

**USEPA Region 6:** Chris Villarreal

**TCEQ:** Jim Sher, Tom Emy

**USFWS:** Paul Bruckwicki, Barry Forsythe, Craig Giggelman

**DOD-TAPP:** H.L. "Bud" Jones

**CES:** Bill Corrigan

**USACE Omaha:** John Cataldo, Jim Moore, Janie Carrig, Doug Pendrell

**TAG:** Wilma Subra

**e<sup>2</sup>m:** Courtney Ingersoll, Susan Gregory

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The meeting was opened by Rose Zeiler with a welcome note to everyone attending. Discussions during the meeting followed the agenda distributed before the meeting. These discussions are summarized below by agenda items.

**Military Munition Response Program Presentation**

John Cataldo, Project Manager for the MMRP project, U.S. Army Corps of Engineers, Omaha District, opened this portion of the meeting with an introduction. Courtney Ingersoll of e<sup>2</sup>m presented the approach, scope, and schedule of the MMRP project. Copies of the presentation were distributed to the meeting participants.

**Groundwater Treatment Plan Report**

Bill Corrigan of CES presented a report on the groundwater treatment plant performance. Copies of the report were distributed to the participants.

- Jim Sher requested an electronic copy of the analytical results from the plant
- Jim Sher also commented that the pump and treat system is not expected to remediate the contamination. An alternate technology should be considered.

**Status of Documents**

Praveen Srivastav discussed the status of documents currently in progress or in review:

- Final Work Plan, Installation-wide Background Study submitted on January 10
- Final Work Plan, Groundwater Data Gaps, Groups 2 and 4 submitted on February 24
- Draft-Final Background Soil Study submitted on March 14, 2004. Comments pending
- Revised Draft Final Rev 01, Feasibility Study, Site 12 submitted on 2/27/04. Comments pending
- Revised Draft Final Rev 0, Feasibility Study, Site 32 will be submitted for Army's review on March 10
- Environmental Condition of Property document will be submitted for regulatory and public review during the week of March 15

Some discussion occurred during this segment of the meeting. Highlights of this discussion were statements from EPA and TCEQ to the effect that:

- RODs can not be finalized without completing installation-wide ecological risk assessment
- RODs can not be finalized without having a formal institutional control guidance in place
- Ecological issues at certain sites may be addressed by screening level assessments

**Comment Resolution, Draft Technical Memorandum, Modeling**

Frank Eidson discussed regulatory comments on the Technical Memorandum. Responses to comments and bulletized list of issues were distributed among participants prior to beginning of the discussion. Shaw's responses were acceptable in general and no additional comments were received from any of the participants. Shaw will proceed with preparing a Final Technical Memorandum.

**Transfer Maps**

Rose Zeiler discussed transfer parcel maps and status of the transfer process with the participants. Highlights of the discussion are:

- Rose pointed out that all of the sites under active investigation and plumes are excluded from the first transfer.
- Jim Sher inquired as to who would be responsible for deed control if the plumes migrate. Rose Zeiler replied that the Army would still be responsible.
- Letter of suitability for transfer for LHAAP 45 is being issued by USFWS to BRAC with copy to EPA and TCEQ
- Decision documents for Groups 1, 3, and 5 sites are adequate. Jim Sher pointed out that LHAAP is under the old risk reduction rules, and industrial human health risk assessments are adequate for LHAAP for its future use as a wildlife refuge. There would be no need to conduct residential risk assessment for these sites.
- The Army is not planning to burn buildings with explosive hazard because an Environmental Assessment would be required in order to do so.

Other discussions that occurred during the meeting are as follows:

- TRC meeting notice should be sent out by regular mail. A mailing list exists for the residents in the area. The list was prepared before the community relations plan was completed for the installation.

- USFWS pointed out that the table in the draft ECOP showing State of Texas listed endangered/threatened species was out of date. A letter was issued to the Army by the State that included the most recent list. Shaw should obtain a copy of this letter.
- The next Monthly Managers Meeting is scheduled to be held at the EPA offices in Dallas on Wednesday, April 21, 9:00 AM
- The next TRC meeting scheduled to be held at LHAAP on Wednesday, June 2, 10:30 AM
- TCEQ was requested to provide construction details and production rates of municipal wells in the vicinity of LHAAP

**Action Items**

- An electronic copy of the MMRP presentation to be provided by e<sup>2</sup>m
- CES to provide GWTP analytical data to TCEQ in electronic form
- Shaw to obtain the letter of endangered/threatened species
- BRAC to obtain the mailing list for TRC meeting notification
- TCEQ to provide construction details and production rates of municipal wells in the vicinity of LHAAP

# **Information for Quarterly TRC Meeting**

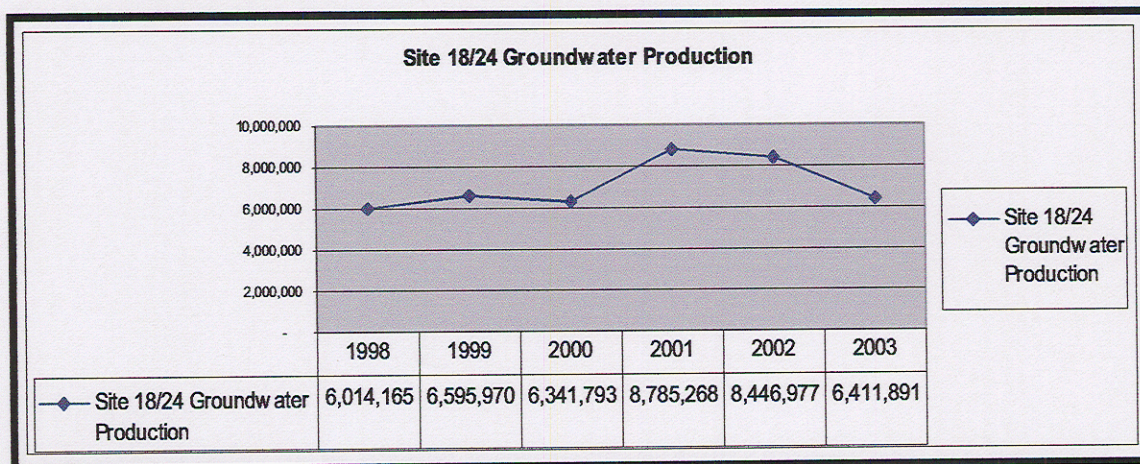
## **Longhorn Army Ammunition Plant Groundwater Treatment Plant Report**

**Site 18/24/16**

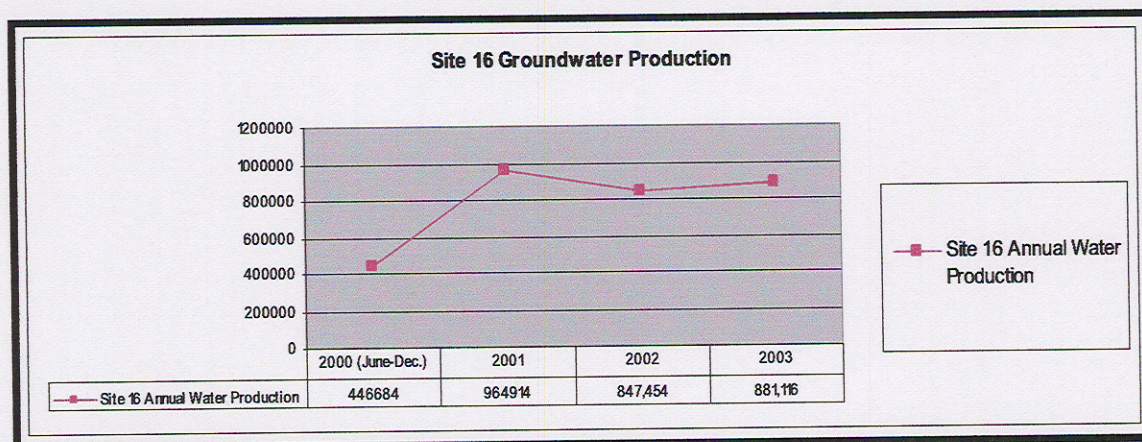
**March 3, 2004**



### Site 18/24 Groundwater Production

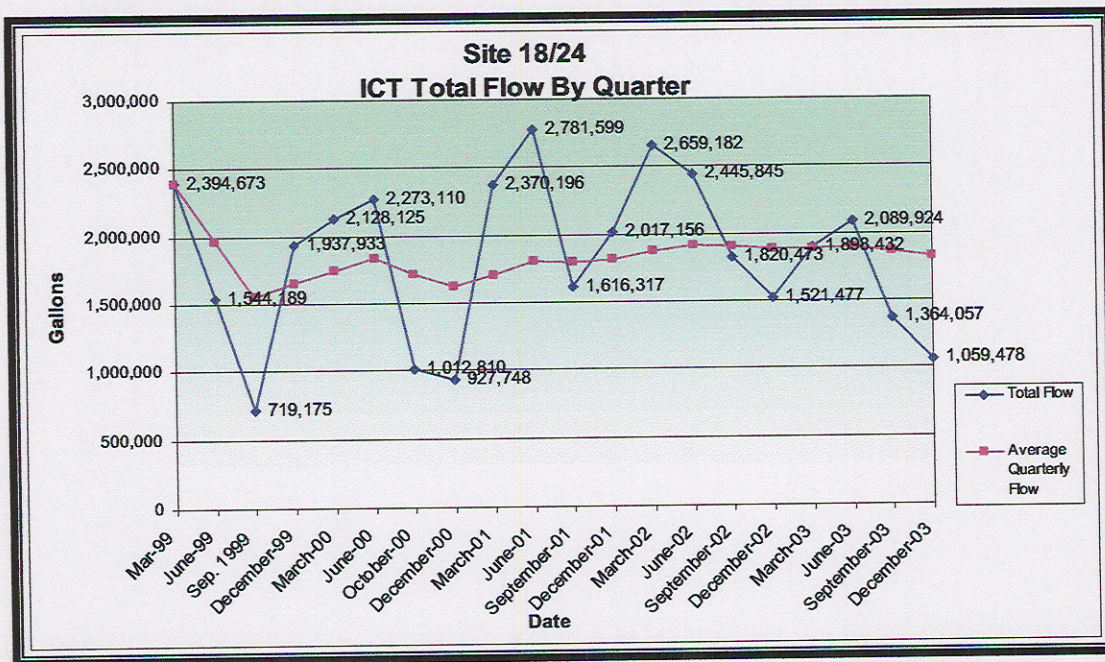


### Site 16 Groundwater Production





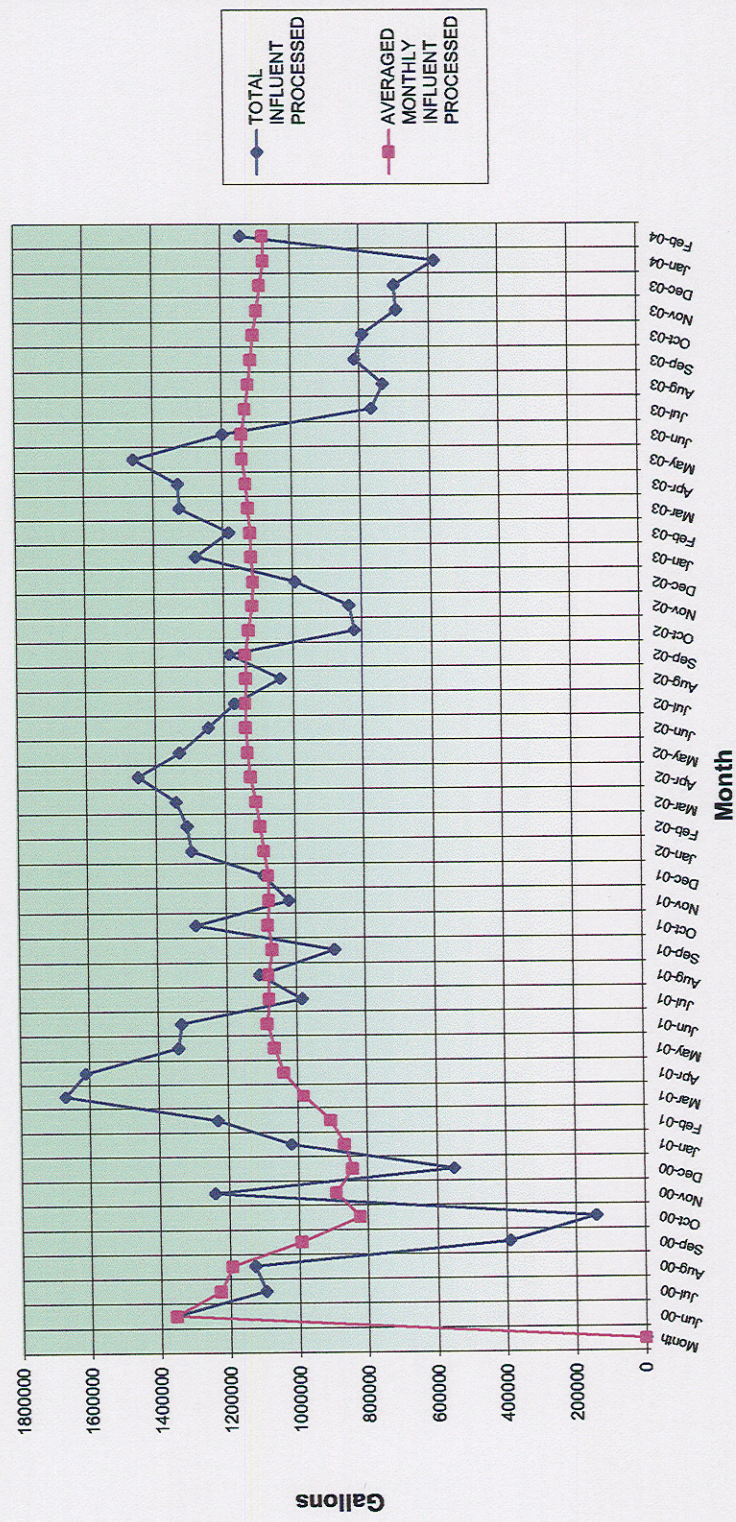
## ICT Total Flow By Quarter





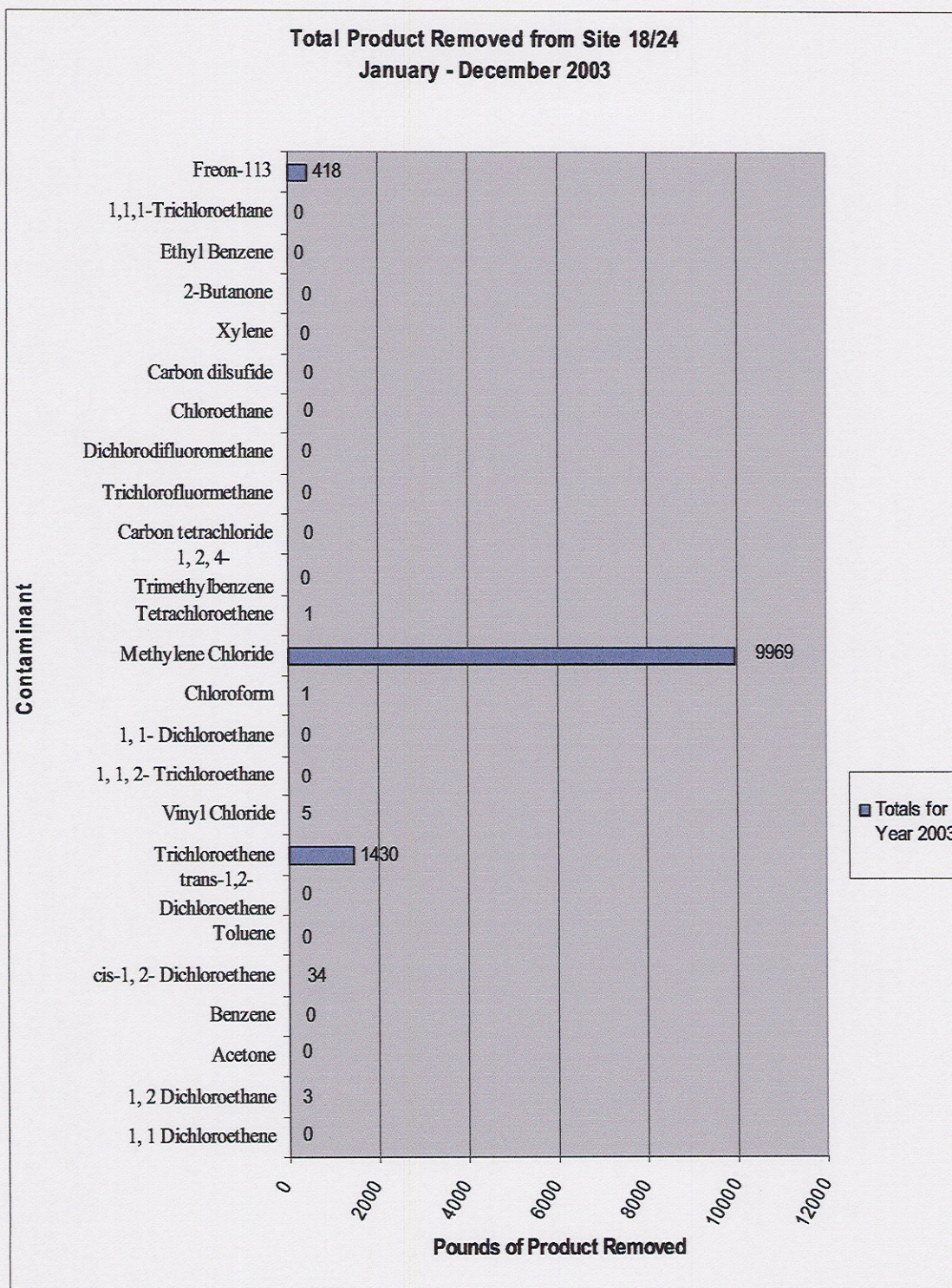
# Water Treated at GWTP June 2000 – February 2004

## Longhorn AAP Groundwater Treatment Plant Water Treated June 2000 thru February 2004





# Volatiles Removed From Groundwater at Site 18/24 Jan.-Dec. 2003





## Analytical Data for Semi-Annual October 2003 ICT Well Samples

| Volatiles in ug/L      | ICT 1      | ICT 2    | ICT 3      | ICT 4   | ICT 4 QC | ICT 4 QA | ICT 5      | ICT 6     | ICT 7      | ICT 8     | ICT 9      |
|------------------------|------------|----------|------------|---------|----------|----------|------------|-----------|------------|-----------|------------|
| Benzene                | 1.31 J     | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Carbon Tetrachloride   | ND         | ND       | ND         | 56.9 J  | ND       | 54.1     | ND         | ND        | ND         | ND        | ND         |
| Chloroform             | ND         | ND       | ND         | ND      | ND       | 39.9     | ND         | ND        | ND         | ND        | ND         |
| cis-1,2-Dichloroethane | 86.4       | 312      | 16,200     | 184 J   | 110 J    | ND       | 9.7        | 2.98 J    | 1.27 J     | 8,730     | 1730 J     |
| 1,1-Dichloroethane     | ND         | 3.65 J   | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| 1,2-Dichloroethane     | 98.5       | 89.6     | 2,500      | 576     | ND       | 361      | ND         | ND        | ND         | ND        | ND         |
| 1,1-Dichloroethene     | 17.4       | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Ethylbenzene           | ND         | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Methylene Chloride     | 7.42 B,J   | 7.81 B,J | 8,300      | 573     | 300 B,J  | 172      | 4 J        | 2.39 B,J  | 2.1 B,J    | 2610000 E | 160000 E,B |
| Styrene                | ND         | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Tetrachloroethane      | ND         | 2.7 J    | ND         | ND      | ND       | 13.1     | ND         | ND        | ND         | ND        | ND         |
| Toluene                | 6.75       | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| 1,1,1-Trichloroethane  | ND         | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| 1,1,2-Trichloroethane  | ND         | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Trichloroethane        | 86         | 2,290    | 42,200     | 15,500  | 14,600   | 18,400   | 357        | 139       | 2.22 J     | 163,000   | 26,900     |
| Vinyl Chloride         | 1120 A-01a | 73.5     | 1590 A-01a | ND      | ND       | ND       | 12.1 A-01a | 2.6 A-01a | 3.38 A-01a | ND        | ND         |
| Xylenes (total)        | ND         | ND       | ND         | ND      | ND       | ND       | ND         | ND        | ND         | ND        | ND         |
| Acetone                | 22.3 B,J   | 20.6 B,J | 3030 J     | 4000 J  | 3010 B,J | ND       | 21.9 B,J   | 17 B,J    | 19.1 B,J   | 37900 B,J | 38000 B,J  |
| Freon 113              | ND         | 2.65 J   | ND         | ND      | ND       | 1,270    | ND         | 13        | ND         | ND        | ND         |
| Chloride in mg/L       | ICT 1      | ICT 2    | ICT 3      | ICT 4   | ICT 4 QC | ICT 4 QA | ICT 5      | ICT 6     | ICT 7      | ICT 8     | ICT 9      |
|                        | 85.5 O-02  | 1,460    | 1,530      | 1,660   | 2,970    | 240      | 3,110      | 21,000    | 20.1       | 1,490     | 14,400     |
| Perchlorate in ug/L    | ICT 1      | ICT 2    | ICT 3      | ICT 4   | ICT 4 QC | ICT 4 QA | ICT 5      | ICT 6     | ICT 7      | ICT 8     | ICT 9      |
|                        | 777        | 4,310    | 6,720      | 201,000 | 190,000  | 94,300   | 116        | 3,500     | 153        | 11,900    | 15,200     |

J Detected but below Reporting Limit; therefore, result is an estimated concentration.

O-02 Due to matrix interference, the sample cannot be accurately quantitated. The reported result is qualitative.

B Analyte is found in the associated method blank as well as in the sample, suspected laboratory contamination.

A-01a Result may bias high.

E The concentration indicated for this analyte is an estimated value above the calibration range of the instrument.

A-01b The percent difference of the response factor between the initial &amp; the continuing calibration verification for this compound is greater than 20%.



## Analytical Data for Semi-Annual October 2003 ICT Well Samples (continued)

| Volatiles in ug/L      | ICT 10  | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D    | ICT 12E    | ICT 12E QC | ICT 12E QA | ICT 13A   | ICT 13B      |
|------------------------|---------|--------|---------|---------|---------|------------|------------|------------|------------|-----------|--------------|
| Benzene                | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | 8.80       | ND        | ND           |
| Carbon Tetrachloride   | 290 J   | ND     | ND      | ND      | ND      | ND         | ND         | ND         | ND         | ND        | ND           |
| Chloroform             | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | 26.6       | ND        | ND           |
| cis-1,2-Dichloroethane | ND      | 194 J  | ND      | 118 J   | 113 J   | 4,860.0    | 14,700     | 10,900     |            | 4,120     | 1,740        |
| 1,1-Dichloroethane     | ND      | ND     | ND      | ND      | ND      | ND         | 99.5 J     | ND         | 91.2       | ND        | ND           |
| 1,2-Dichloroethane     | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | ND         | ND        | ND           |
| 1,1-Dichloroethene     | ND      | ND     | ND      | ND      | ND      | ND         | 264 J      | 247 J      | 281        | 212 J     | 84.3         |
| Ethylbenzene           | ND      | ND     | ND      | ND      | ND      | ND         | 132 J      | ND         | ND         | ND        | ND           |
| Methylene Chloride     | ND      | ND     | ND      | ND      | ND      | 339,000    | 123 J      | ND         | 89.4       | ND        | ND           |
| Styrene                | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | ND         | ND        | ND           |
| Tetrachloroethane      | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | 5.26       | ND        | ND           |
| Toluene                | ND      | ND     | ND      | ND      | ND      | ND         | 491 J      | 162 J      | ND         | ND        | ND           |
| 1,1,1-Trichloroethane  | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | ND         | ND        | ND           |
| 1,1,2-Trichloroethane  | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | 5.02       | ND        | ND           |
| Trichloroethene        | 5,850   | 3,060  | 2,160   | 6,910   | 2,700   | 102,000    | 18,100     | 18,000     | 22,600     | 30,800    | 10,800       |
| Vinyl Chloride         | ND      | ND     | ND      | ND      | ND      | 1240 A-01b | 4600 A-01b | 3220 A-01b | 2,460      | 209 A-01b | 168 A-01b, J |
| Xylenes (total)        | ND      | ND     | ND      | ND      | ND      | ND         | 736 J      | 219 J      | ND         | ND        | ND           |
| Acetone                | 1580 J  | 3120 J | 2580 J  | 1480 J  | 1360 J  | ND         | ND         | 601 J      | ND         | ND        | 374 J        |
| Freon 113              | ND      | ND     | ND      | ND      | ND      | ND         | ND         | ND         | 667        | ND        | ND           |
| Chloride in mg/L       | ICT 10  | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D    | ICT 12E    | ICT 12E QC | ICT 12E QA | ICT 13A   | ICT 13B      |
|                        | 325     | 1,560  | 1,540   | 832     | 517     | 564        | 886        | 940        | 573        | 923       | 209          |
| Perchlorate in ug/L    | ICT 10  | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D    | ICT 12E    | ICT 12E QC | ICT 12E QA | ICT 13A   | ICT 13B      |
|                        | 114,000 | 30,300 | 5,990   | 72,700  | 26,800  | 153,000    | 7,270      | 7,540      | 7,470      | 60,700    | 3,680        |

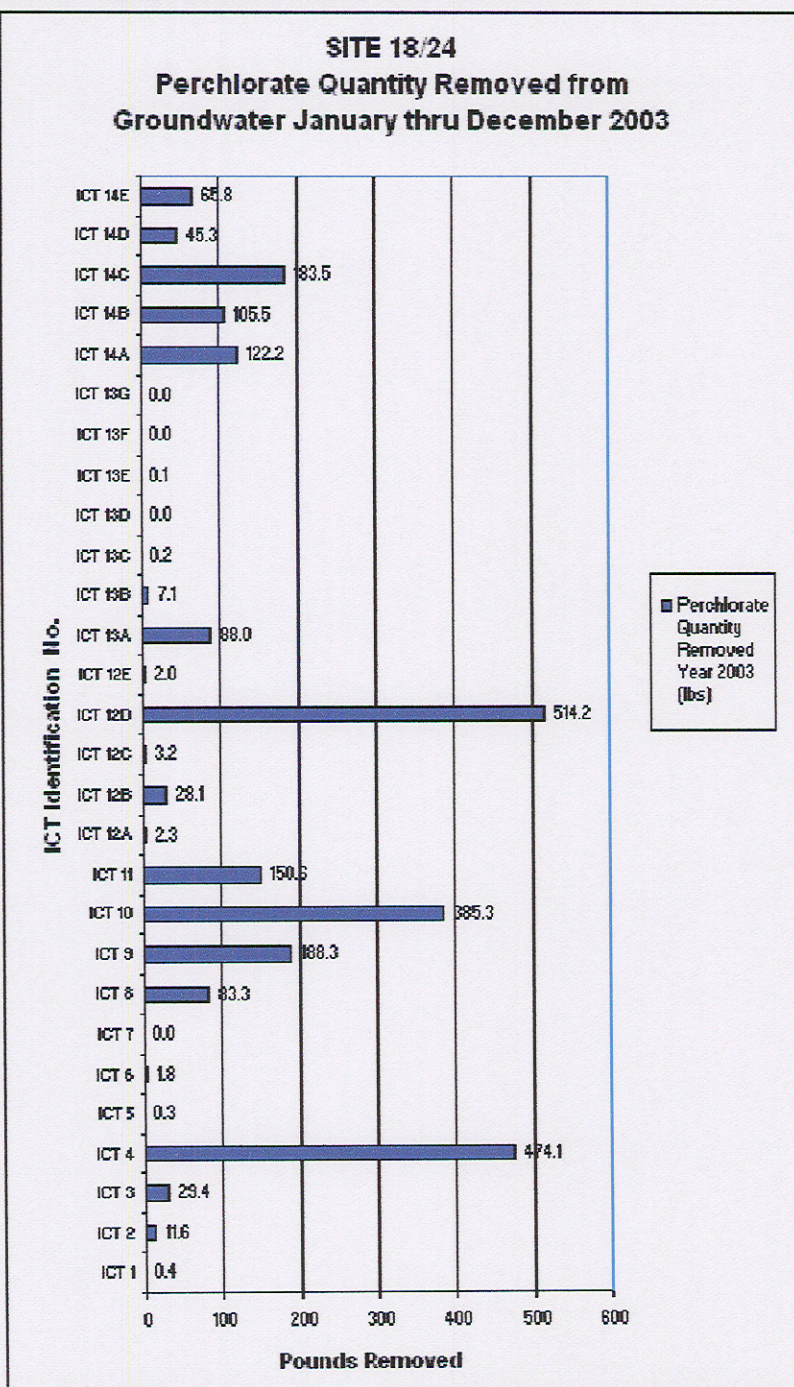
## Analytical Data for Semi-Annual October 2003 ICT Well Samples (continued)

| Volatiles in ug/L      | ICT 13C     | ICT 13D  | ICT 13E  | ICT 13F  | ICT 13G  | ICT 14A  | ICT 14B  | ICT 14C  | ICT 14C QC | ICT 14C QA | ICT 14D  | ICT 14E  |
|------------------------|-------------|----------|----------|----------|----------|----------|----------|----------|------------|------------|----------|----------|
| Benzene                | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | 3.66 J   | 3.44 J   |
| Carbon Tetrachloride   | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| Chloroform             | ND          | ND       | ND       | ND       | ND       | ND       | ND       | 3.24 J   | 3.95 J     | ND         | 28.3     | 16.3     |
| cis-1,2-Dichloroethane | 1,380       | 1.73 J   | ND       | ND       | ND       | 9.59     | 6.60     | 183      | 150        |            | 1,360    | 100      |
| 1,1-Dichloroethane     | ND          | ND       | ND       | ND       | ND       | 1.21 J   | 1.47 J   | 3.75 J   | 3.69 J     | ND         | 13.6     | 1.29 J   |
| 1,2-Dichloroethane     | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | 5.21     | 215      |
| 1,1-Dichloroethane     | 77.8 J      | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| Ethylbenzene           | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| Methylene Chloride     | ND          | 3.21 B,J | 2.39 B,J | 2.89 B,J | 4.04 B,J | 4.63 B,J | 5.06 B,J | 6.17 B,J | 7.02 B,J   | ND         | 18.5     | 17.6     |
| Styrene                | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| Tetrachloroethane      | ND          | ND       | ND       | ND       | ND       | ND       | ND       | 1.29 J   | 1.28 J     | ND         | 2.6 J    | 1.87 J   |
| Toluene                | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| 1,1,1-Trichloroethane  | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| 1,1,2-Trichloroethane  | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | 2.89 J   | 16.50    |
| Trichloroethane        | 11,400      | 2.65 J   | 2.41 J   | ND       | 1.11 J   | 68.9     | 82.1     | 1,510    | 1,600      | 1,320      | 14,200   | 21,000   |
| Vinyl Chloride         | 152 A-01b,J | 3.15     | 2.06     | ND       | ND       | 7.66     | 6.57     | 28       | 26.4       | 23.8       | 336 E    | 86.5     |
| Xylenes (total)        | ND          | ND       | ND       | ND       | ND       | ND       | ND       | ND       | ND         | ND         | ND       | ND       |
| Acetone                | 564 J       | 16.6 B,J | 18.1 B,J | 15.2 B,J | 12.7 B,J | 11.4 B,J | 22.6 B,J | 12.6 B,J | 15.7 B,J   | ND         | 13.2 B,J | 16.8 B,J |
| Freon 113              | ND          | ND       | ND       | ND       | ND       | 2.51 J   | ND       | 4.82 J   | 5.02       | 2,520      | 23.4     | 77.7     |
| Chloride in mg/L       | ICT 13C     | ICT 13D  | ICT 13E  | ICT 13F  | ICT 13G  | ICT 14A  | ICT 14B  | ICT 14C  | ICT 14C QC | ICT 14C QA | ICT 14D  | ICT 14E  |
|                        | 265         | 298      | 632      | 30.1     | 216      | 818      | 18.5     | 790      | 1,280      | 684        | 26,700   | 26,700   |
| Perchlorate in ug/L    | ICT 13C     | ICT 13D  | ICT 13E  | ICT 13F  | ICT 13G  | ICT 14A  | ICT 14B  | ICT 14C  | ICT 14C QC | ICT 14C QA | ICT 14D  | ICT 14E  |
|                        | 9,340       | 0.5 J    | 498      | 11.1     | 7,410    | 41,100   | 38,400   | 89,900   | 107,000    | 43,300     | 12,300   | 55,800   |



# Perchlorate Removed from Site 18/24 in Year 2003

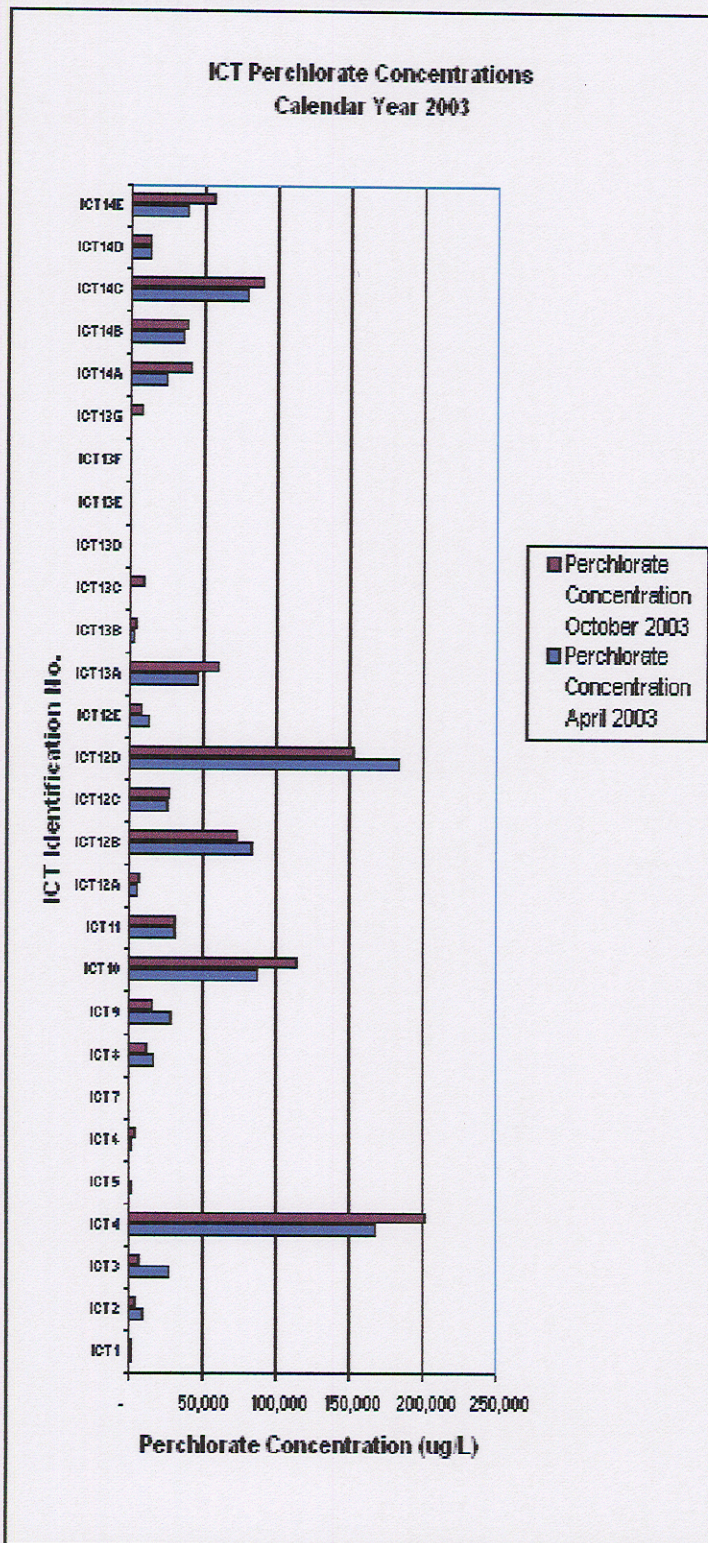
| Interceptor<br>Collection<br>Trench ID<br>Number | Perchlorate<br>Quantity<br>Removed<br>Year 2003<br>(lbs) |
|--------------------------------------------------|----------------------------------------------------------|
| ICT 1                                            | 0.393                                                    |
| ICT 2                                            | 11.577                                                   |
| ICT 3                                            | 29.415                                                   |
| ICT 4                                            | 474.058                                                  |
| ICT 5                                            | 0.308                                                    |
| ICT 6                                            | 1.823                                                    |
| ICT 7                                            | 0.006                                                    |
| ICT 8                                            | 83.330                                                   |
| ICT 9                                            | 188.338                                                  |
| ICT 10                                           | 385.320                                                  |
| ICT 11                                           | 150.620                                                  |
| ICT 12A                                          | 2.256                                                    |
| ICT 12B                                          | 28.062                                                   |
| ICT 12C                                          | 3.201                                                    |
| ICT 12D                                          | 514.247                                                  |
| ICT 12E                                          | 1.972                                                    |
| ICT 13A                                          | 88.009                                                   |
| ICT 13B                                          | 7.108                                                    |
| ICT 13C                                          | 0.165                                                    |
| ICT 13D                                          | 0.013                                                    |
| ICT 13E                                          | 0.083                                                    |
| ICT 13F                                          | 0.000                                                    |
| ICT 13G                                          | 0.000                                                    |
| ICT 14A                                          | 122.210                                                  |
| ICT 14B                                          | 105.478                                                  |
| ICT 14C                                          | 183.469                                                  |
| ICT 14D                                          | 45.350                                                   |
| ICT 14E                                          | 65.773                                                   |
| Total<br>Removed                                 | 2492.58                                                  |





# Perchlorate Concentrations in ICT's at Site 18/24 Calendar Year 2003

| Interceptor Collection Trench ID Number | Perchlorate Concentration April 2003 | Perchlorate Concentration October 2003 |
|-----------------------------------------|--------------------------------------|----------------------------------------|
| ICT 1                                   | 1,080                                | 777                                    |
| ICT 2                                   | 9,480                                | 4,310                                  |
| ICT 3                                   | 27,100                               | 6,720                                  |
| ICT 4                                   | 168,000                              | 201,000                                |
| ICT 5                                   | 1,070                                | 116                                    |
| ICT 6                                   | 1,180                                | 3,500                                  |
| ICT 7                                   | 34                                   | 153                                    |
| ICT 8                                   | 16,200                               | 11,900                                 |
| ICT 9                                   | 28,800                               | 15,200                                 |
| ICT 10                                  | 86,600                               | 114,000                                |
| ICT 11                                  | 30,600                               | 30,300                                 |
| ICT 12A                                 | 5,670                                | 5,990                                  |
| ICT 12B                                 | 82,700                               | 72,700                                 |
| ICT 12C                                 | 26,000                               | 26,800                                 |
| ICT 12D                                 | 183,000                              | 153,000                                |
| ICT 12E                                 | 12,800                               | 7,270                                  |
| ICT 13A                                 | 45,900                               | 60,700                                 |
| ICT 13B                                 | 3,200                                | 3,680                                  |
| ICT 13C                                 | 20                                   | 9,340                                  |
| ICT 13D                                 | 55                                   | -                                      |
| ICT 13E                                 | 144                                  | 498                                    |
| ICT 13F                                 | -                                    | 11                                     |
| ICT 13G                                 | -                                    | 7,410                                  |
| ICT 14A                                 | 24,300                               | 41,100                                 |
| ICT 14B                                 | 35,700                               | 38,400                                 |
| ICT 14C                                 | 79,700                               | 89,900                                 |
| ICT 14D                                 | 12,300                               | 12,300                                 |
| ICT 14E                                 | 39,100                               | 55,800                                 |

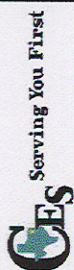




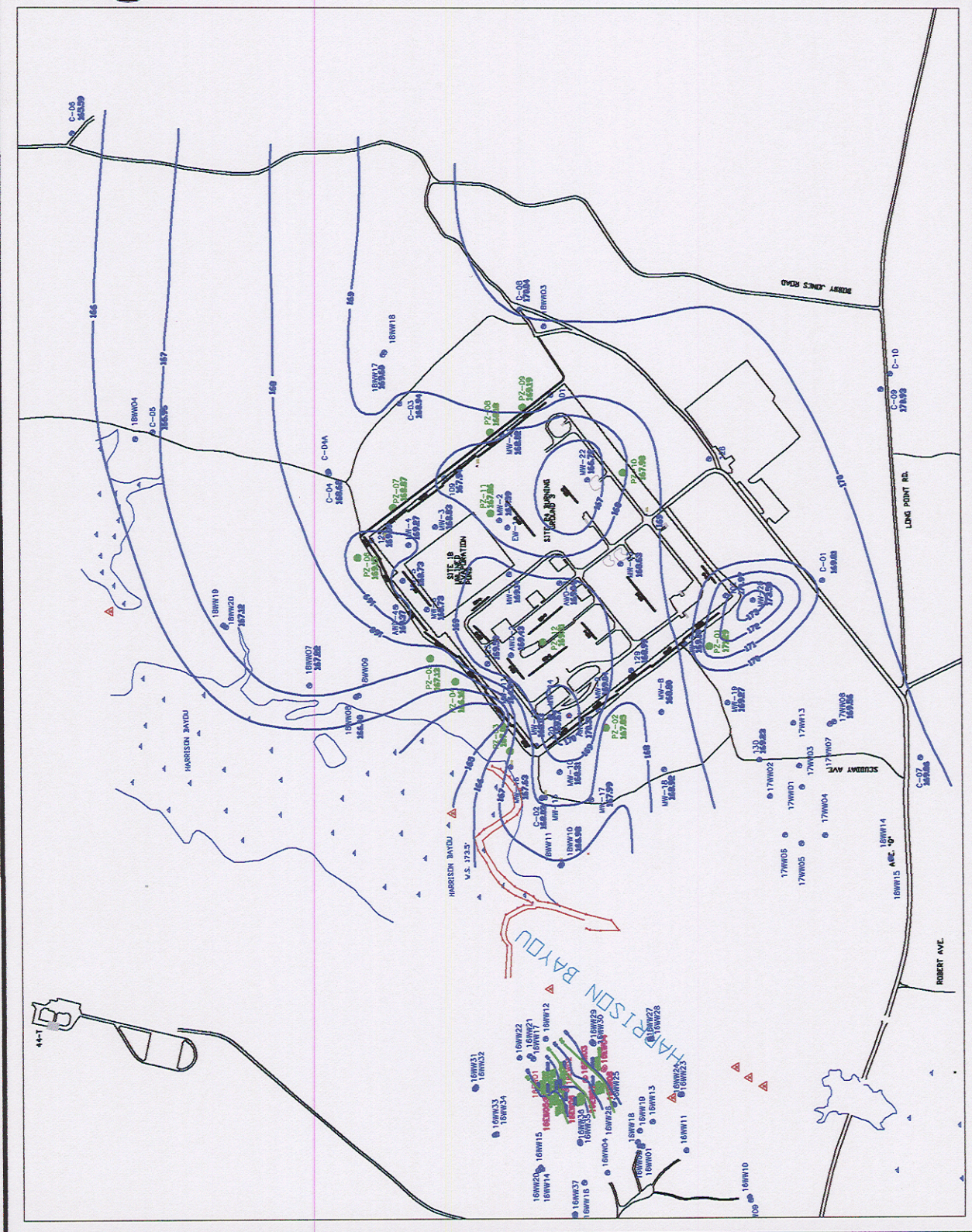
# Contaminants Removed for Site 18/24 Apr.1998 to Dec.2003

| Contaminants                                 | 1998        | 1999        | 2000         | 2001         | 2002         | 2003         | Total Pounds<br>Removed to<br>Date |
|----------------------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|------------------------------------|
| 1, 1 Dichloroethene                          | 0.00        | 0.00        | 0.17         | 14.24        | 7.87         | 0.11         | 22.39                              |
| 1, 2 Dichloroethane                          | 0.00        | 0.00        | 0.73         | 5.89         | 4.16         | 2.71         | 13.48                              |
| Acetone                                      | 0.00        | 192.54      | 227.93       | 0.92         | 0.09         | 0.00         | 421.47                             |
| Benzene                                      | 0.00        | 0.00        | 0.00         | 0.44         | 0.05         | 0.02         | 0.52                               |
| cis-1, 2- Dichloroethene                     | 0.00        | 14.04       | 16.94        | 0.00         | 0.00         | 33.68        | 64.66                              |
| Toluene                                      | 0.00        | 0.00        | 0.00         | 0.44         | 0.06         | 0.03         | 0.53                               |
| trans-1,2- Dichloroethene                    | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         | 0.00                               |
| Trichloroethene                              | 134.03      | 213.19      | 1168.32      | 1788.98      | 1525.59      | 1429.62      | 6,259.72                           |
| Vinyl Chloride                               | 0.00        | 0.00        | 5.34         | 8.57         | 11.61        | 5.35         | 30.87                              |
| 1, 1, 2- Trichloroethane                     | 0.00        | 0.00        | 0.01         | 0.53         | 0.03         | 0.02         | 0.59                               |
| 1, 1- Dichloroethane                         | 0.00        | 0.00        | 0.04         | 0.16         | 0.18         | 0.03         | 0.41                               |
| Chloroform                                   | 0.00        | 0.00        | 0.03         | 2.64         | 0.35         | 1.18         | 4.20                               |
| Methylene Chloride                           | 2061.97     | 2042.18     | 14620.72     | 20584.32     | 14259.12     | 9969.13      | 63,537.44                          |
| Tetrachloroethene                            | 0.00        | 0.00        | 0.32         | 1.48         | 0.02         | 1.24         | 3.06                               |
| 1, 2, 4-Trimethylbenzene                     | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         |                                    |
| Carbon tetrachloride                         | 0.00        | 0.00        | 0.00         | 0.20         | 0.26         | 0.07         | 0.54                               |
| Trichlorofluoromethane                       | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         |                                    |
| Dichlorodifluoromethane                      | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         | 0.00                               |
| Chloroethane                                 | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         |                                    |
| Carbon disulfide                             | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         |                                    |
| Xylene                                       | 0.00        | 0.00        | 0.00         | 0.13         | 0.00         | 0.00         | 0.13                               |
| 2-Butanone                                   | 0.00        | 0.00        | 0.00         | 0.00         | 0.00         | 0.00         |                                    |
| Ethyl Benzene                                | 0.00        | 0.00        | 0.00         | 0.80         | 0.01         | 0.00         | 0.81                               |
| 1,1,1-Trichloroethane                        | 0.00        | 0.00        | 0.00         | 0.33         | 0.00         | 0.00         | 0.33                               |
| Freon-113                                    | 0.00        | 0.00        | 0.00         | 679.70       | 1221.26      | 417.54       | 2,318.50                           |
| <b>Total Volatiles Removed<br/>Per Year</b>  | <b>2196</b> | <b>2462</b> | <b>16041</b> | <b>23090</b> | <b>17031</b> | <b>11861</b> | <b>72680</b>                       |
| <b>Total Perchlorate<br/>Removed to Date</b> | <b>0</b>    | <b>0</b>    | <b>103</b>   | <b>2577</b>  | <b>3027</b>  | <b>2493</b>  | <b>8199</b>                        |

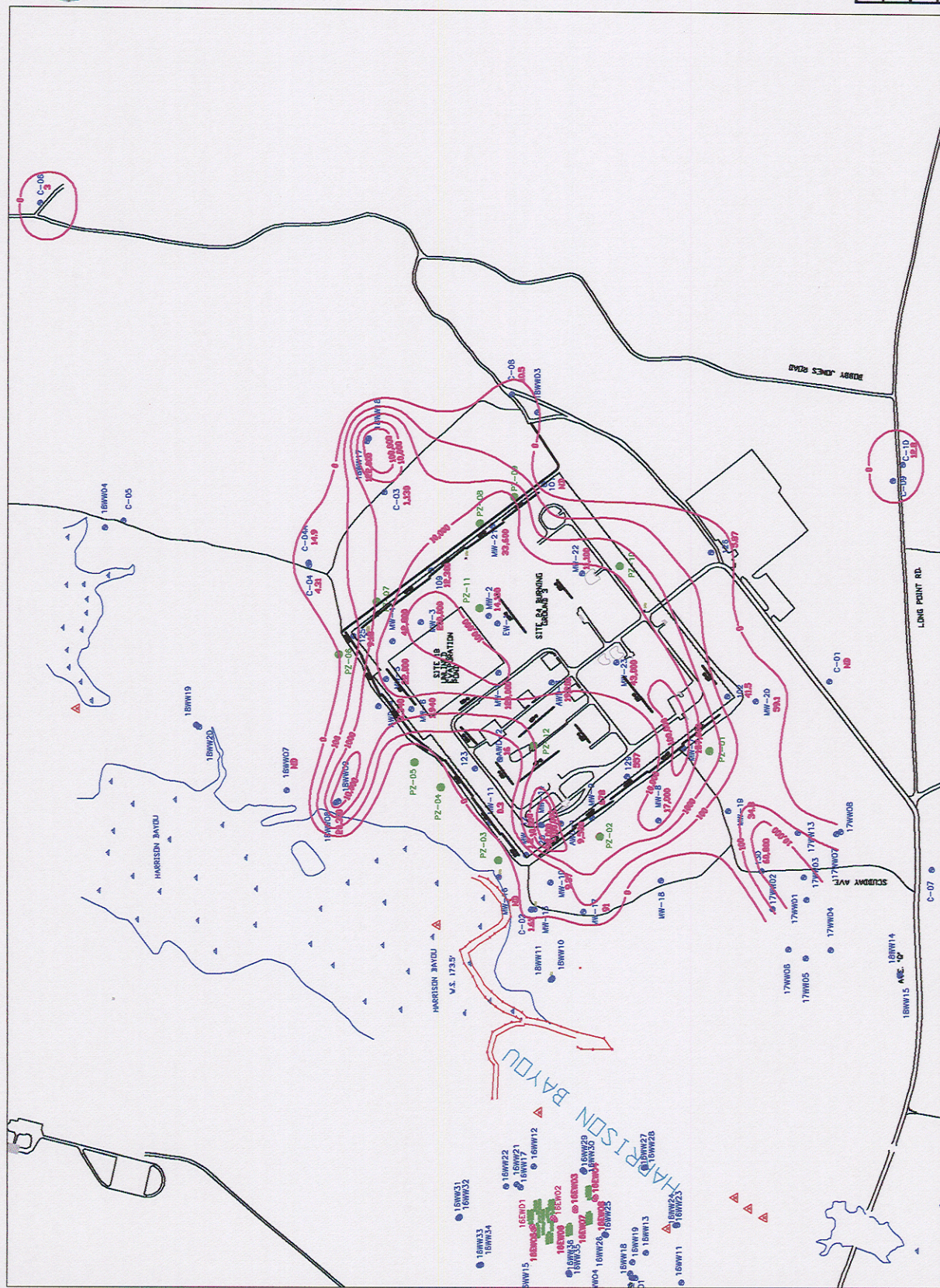




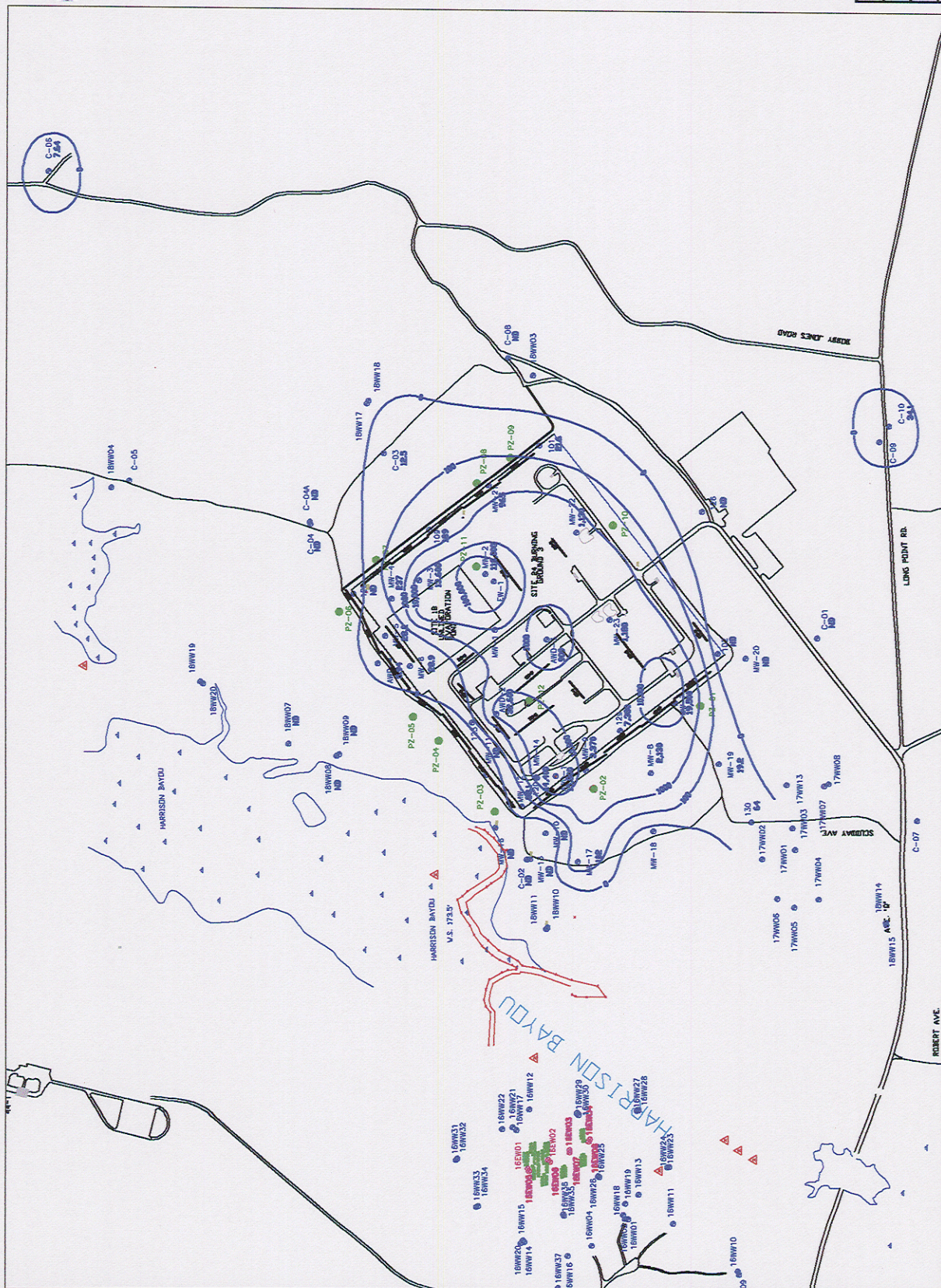
|                                |
|--------------------------------|
| Complete Environmental Service |
| LHAAP Sites 18 & 24            |
| DATE: Dec. 1, 2003             |
| Groundwater Levels             |



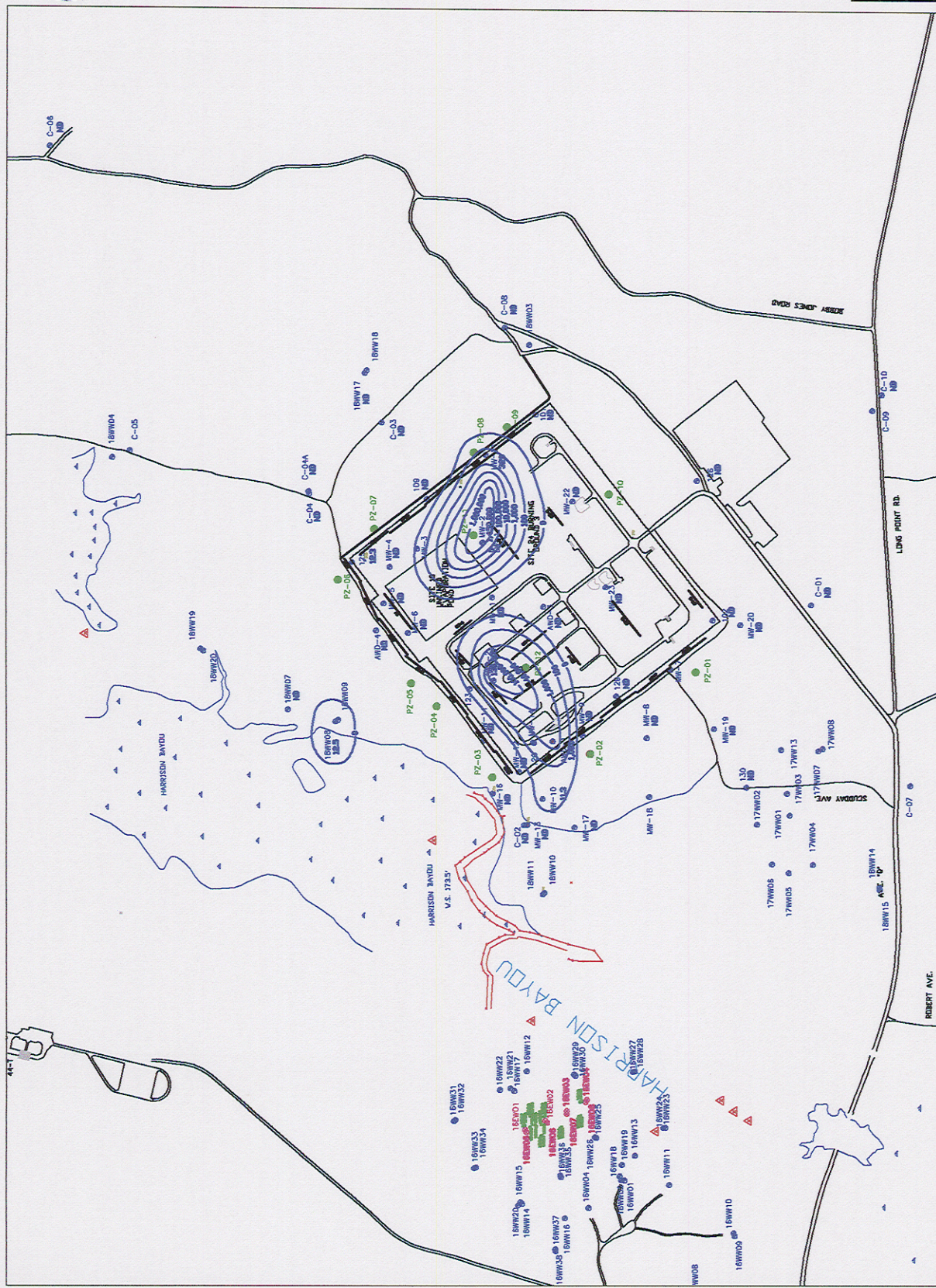














**Response to Comments on  
Draft Technical Memorandum: Modeling Approach for Derivation of Soil and  
Groundwater Concentrations Protective of Surface Water and Sediment**

**Contract No. DACA56-94-D-0020, Delivery Order No. 0109  
Longhorn Army Ammunition Plant, Karnack, Texas**

**March 3, 2004**

***Comments Related to Selection of Chemicals for Modeling***

1. Several comments address the lack of correspondence between chemicals identified in Tables and the corresponding text and the treatment of human and ecological receptors.  
**Response:** Agree. Group 2 and Group 4 sites were not grouped for any geographical similarities. **These groupings will be eliminated and all sites will be considered in Tables 1 and 2.** Table 1 will contain all chemicals and media for human receptors. Table 2 will contain all chemicals for ecological receptors.
2. Other comments note that some chemicals selected for modeling apparently do not occur at any upgradient site in any medium.  
**Response:** Agree. All chemicals identified in Group 2 and Group 4 risk assessments as posing unacceptable human health and ecological risk are shown in the revised Tables. This approach provides more correspondence to chemicals identified as COCs in Caddo Lake and its tributaries. This list of COC candidates for modeling will be reduced (see next response).
3. These comments stress the need to justify selection of each chemical for modeling.  
**Response:** Agree. Justification is provided by the 2002 risk assessments and FS reports and the 2003 perchlorate study and will be described in the revised memo.

***Comments Related to Numbers of Samples, Survey Locations for Modeling and Values for Modeling Parameters***

1. Several comments address the need for specific information on the media involved in the modeling and types of data that will be used.  
**Response:** Agree. The matrix of concern and type of data for each matrix will be given in the revised memo.
2. Several comments address the need for specific information on the values of input parameters used in the models and the need for model calibration.  
**Response:** Disagree. The values for each model variable are specific to each site or location. The compilation of this information and calibration of models are beyond the scope of this technical memorandum. **This necessary information will be included in the report on modeling results and conclusions.**
4. Two comments note the need for definitions of watershed areas and an installation-wide flow model.  
**Response:** Agree. This information was developed by the U.S. Army Groundwater Modeling Technical Support Center in 2001. **This information will be used wherever possible in the modeling effort.**

***Comments Related to the Purpose of the Modeling Effort***

1. Several comments noted that the purpose of the modeling effort should be to calculate contaminant concentrations in soil and groundwater that are protective of both human and ecological health at locations both on- and off-LHAAP property.  
**Response:** Agree. The memo will be revised accordingly.



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October 2003

Contract No. DACA56-94-D-0020, Delivery Order No. 0109  
Longhorn Army Ammunition Plant, Karnack, Texas

Response Date: February 25, 2004

**Reviewers:** Cheryl Groenjes (CX-HTRW), Steve White (CX-HTRW), Chris Villarreal (USEPA), Charles D. Stone (TCEQ), Wilma Subra (TAG)

| Comment Number                          | Page(s)/Section                    | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                | A or D <sup>2</sup> |
|-----------------------------------------|------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Comments from Cheryl Groenjes (CX-HTRW) |                                    |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| 1.                                      | Pg 2, 2.1                          |                | Include site 16 in listing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | C                    | Corrections will be made to first line of Section 2.1 and table headings as needed.                                                                                                                                                                                                                                                                                                                                                                     |                     |
| 2a.                                     | Pg 2-4, 2.1.1 – 2.1.5 and Table 1. |                | The summary text on Contaminants of Concern (COC) within these sections is not consistent with the COC information presented in Table 1. For instance, it is unclear whether the 'x' used for several metals represents the noted human noncancer HI > 1 as noted in the legend. However, the shading definition further complicates this by noting that it is eco-risk 'only'. Suggest those COCs that are based on eco-risk only - use a different identifier (or separate tables) to avoid this confusion and to emphasize the difference between the eco and human-health. See additional comments for specific sections below. Suggest text and table revisions as follows. | C                    | Separate tables will be prepared for human health and ecological concerns in the revised memorandum. The text of Sections 2.1.1 through 2.1.5 will be revised and clarified accordingly.                                                                                                                                                                                                                                                                |                     |
| 2b.                                     | 2.1.1                              |                | Site 17 has identified TCDD as a COC but is not discussed within this paragraph. Address within the summary text for completeness. Table 1- Suggest noting the soil column as 'Surface' soil, or clarify if any of the information pertains to subsurface soils. The usefulness of the last sentence is confusing, for it does not pertain to the matrix being discussed, and seems to directly dispute the objectives of the modeling study. Suggest rewording of the sentence to clarify this is based on existing data from samples of these other media.                                                                                                                     | C                    | Site 17 will be discussed in the revised Section 2.1.1. The information used in this memorandum was taken from the Baseline Human Health and Ecological Risk Assessments and Feasibility Studies for the sites in question. The cancer risk or noncancer hazard estimated in soil from any depth was used as the basis for inclusion of the chemical in the tables. The last sentence will be deleted and the point will be discussed in Section 2.1.3. |                     |

1. Respondent Concurs (C), Does not concur (D), or takes Exception (E).
2. Commenter Agrees (A) with response, or Does not agree (D) with response.



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October 2003

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Longhorn Army Ammunition Plant, Karnack, Texas

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| Comment Number | Page(s)/Section | Paragraph/Line            | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                            | A or D <sup>2</sup> |
|----------------|-----------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 2c.            | 2.1.2           |                           | Summary text does not address the remaining (non-VOC) parameters that have COCs identified in Table 1: TCDD, perchlorate, metals (Sb, Ni, Mn, Al, As), and SVOCs (nitro-toluenes). The usefulness of the last sentence is confusing, for it does not pertain to the matrix being discussed, and seems to directly dispute the objectives of the modeling study. See 2.b for suggested clarifications.                                                                                                                                                                    | C                    | Separate tables will be prepared for human health and ecological concerns in the revised memorandum. This revision of the tables corresponding text will clarify the discussion of chemicals identified. The last sentence will be deleted and the point will be discussed in Section 2.1.3.                        |                     |
| 2d.            | 2.1.3           |                           | For site 29 –fluoranthene is noted with a shaded 'x' but is not addressed within the text. Refer to comment 2.a. as it pertains to the metals data presentation and edit in a similar fashion to avoid confusion. The last sentence notes several metals and VOCs as potential exposure from ingestion of fish. However, table 1 presents data for Harrison Bayou and Caddo Lake (fish ingestion) encompassing additional target analytes not discussed within the text, such as TCDD and SVOCs (phthalates). Edit for consistency.                                      | C                    | Separate tables will be prepared for human health and ecological concerns in the revised memorandum. This revision of the tables corresponding text will clarify the discussion of chemicals identified. The role of fish ingestion as a rationale for modeling the chemicals shown will be addressed specifically. |                     |
| 3.a            | Pg. 3, 2.1.4.   | 1 <sup>st</sup> paragraph | Define applicable media that are noted being discussed here as representing the greatest hazards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | C                    | The levels of ecological hazard and associated chemicals were identified in the reference cited (Jacobs, 2002a). The applicable media will be included in this paragraph.                                                                                                                                           |                     |
| 3.b            | Pg. 3, 2.1.4.   | 2 <sup>nd</sup> paragraph | The last sentence is misconstrued – the various forms of a metal tested in the laboratory are not necessarily more toxic than the metals found in the samples in their native environment. The form of metals subjected to analysis is dictated by what the preparatory method is employed. Sampling and preparatory / analytical procedures can be modified to focus on a particular form (oxidative state) of a metal of interest. In the LHAAP case, the methods used should be considered as representing "total recoverable metals", and not a particular form that | C                    | Agreed. The sentence will be modified to address inherent conservatism of the screening process more clearly.                                                                                                                                                                                                       |                     |

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2. Commenter Agrees (A) with response, or Does not agree (D) with response.



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October 2003

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| Comment Number | Page(s)/Section           | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | A or D <sup>2</sup> |
|----------------|---------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                |                           |                | represents greater toxicity than what is present within the media. What can be assumed, is the results generated (because they are considered totals) are generally a "worst case scenario" – especially when evaluated against a decision levels that are based on a specific metal form which is more toxic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |
| 4.             | Table 2 and Pg. 4, 2.1.5. |                | The proposed modeling for phthalates is not supported for they are not identified as COCs within any of the media at any of the Group 2 sites. There is no discussion within the text to support this parameter's modeling evaluation and why it was proposed within Table 2. Edit document to clarify why the phthalates are being evaluated - when they have not been identified as COCs. FYI: These plasticizer compounds are very prevalent within most laboratory atmospheres, and are commonly represented as common lab contaminants. Suggest verifying a thorough data review, including batch QC samples has been performed to evaluate whether these compounds represent potential cross contamination from the laboratory environment. Caution should be exercised here and at a minimum appropriate clarification be included within the text to support the proposed modeling effort presented in Table 2. | C                    | <p>It is true that phthalates were not identified in the Feasibility Study as principal COCs or as targets for remediation at any of the Group 2 sites. However, the Baseline Human Health Risk Assessment estimated 1E-03 risk associated with ingestion of fish from Caddo Lake. Because the phthalates could have come from somewhere on the LHAAP, even if they represent very low concentrations that accumulate in fish, the modeling approach will address this pathway. The test will be revised to address this specific pathway.</p> <p>It is true that phthalates are ubiquitous in the environment and are common laboratory contaminants. However, they were not excluded from previous risk assessments or feasibility studies on that basis and, in the absence of other information to the contrary, they will be considered in the modeling effort.</p> <p>It is beyond the scope of the modeling effort to repeat validation of the data and batch QC samples validated in previous reports. The portions of the risk assessment and feasibility study documents pertinent to data validation will be cited in the report of modeling results. However, statements in the previous reports that note cross contamination or</p> |                     |

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| Comment Number | Page(s)/Section                   | Paragraph/Line            | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                       | A or D <sup>2</sup> |
|----------------|-----------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                |                                   |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      | <p>other laboratory problems will be cited in the modeling reports will be noted and their impact on the modeling conclusions will be discussed.</p> <p>The rationale for including each chemical in the modeling effort will be clarified in the revised memorandum.</p>                                                                                      |                     |
| 5.             | Pg. 5, 2.2.1 - 2.2.4 and Table 3. |                           | The Group 4 site's COCs text is very general, which misleads the discussion to the extent of sites actually impacted and associated COCs present, in comparison to the data presented in Table 3. Suggest appropriate detail be added to the text to accurately describe where and what COCs are present to enhance agreement between the text and associated tables.                                                                                                                                                                                               | C                    | Because the LHAAP sites were included in Group 2 or Group 4 based on administrative, not geographic, considerations, the revised memorandum will not address sites as Group 2 or Group 4 sites and the outline of the memorandum will be changed. Appropriate detail to describe COCs and modeling locations will be given in the revised memorandum.          |                     |
| 6.             | Pg. 6, 2.2.5 and Table 3.         | 1 <sup>st</sup> paragraph | Assuming Table 3 is correct, Site 67 is incorrectly included within this listing of the sites where metals are noted as a COC for potential human health effects.                                                                                                                                                                                                                                                                                                                                                                                                   | C                    | Site 67 and related chemicals will be correctly described the revised tables See response to Comments 2a through 2c.                                                                                                                                                                                                                                           |                     |
| 7.             | Table 4 and pg.4, 2.1.5.          |                           | The proposed modeling for perchlorate (at location 7), and phthalate esters (all locations) is not supported for they are not identified as COCs in their associated Group 4 sites. Edit document to clarify why these compounds are being evaluated - when they have not been identified as site-related COCs. Refer to comment 7 at it pertain to phthalates being common lab contaminants. Caution should be exercised here and at a minimum appropriate clarification be included within the text to support the proposed modeling effort presented in Table 4. | C                    | The designations of sites belonging to Group 2 or Group 4 will not be used in the revised memorandum (see response to Comment 5). Estimated risks for perchlorates and bis-(2-ethylhexyl)phthalate associated with potential ingestion of fish from Caddo Lake reported in the Feasibility Study for Group 2 sites (Jacobs, 2002a). See response to Comment 4. |                     |
| 8.             | Pg. 15, 5.0.                      |                           | Summary text identifies several chemical compounds as Soil COCs and GW COCs, which are not                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | C                    | Tables 1 through 4 will be separated to address chemicals related to potential human health risks or                                                                                                                                                                                                                                                           |                     |

1. Respondent Concurs (C), Does not concur (D), or takes Exception (E).
2. Commenter Agrees (A) with response, or Does not agree (D) with response.



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October 2003

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Longhorn Army Ammunition Plant, Karnack, Texas

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| Comment Number | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                              | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | A or D <sup>2</sup> |
|----------------|-----------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                |                 |                | substantiated by the information included in previous text or tables 1 and 3. These include perchlorate (not a Soil COC anywhere), phthalate esters (not a Soil or GW COC anywhere), mononitrated toluenes (these are not Soil COCs but should be GW COCs), and dinitrotoluenes (wrong matrix). Edit for consistency.                                                |                      | ecological risks (see responses to Comments 2a through 2c). The identifications as either Group 2 or Group 4 sites will be dropped (see response to Comment 5.)<br><br>The text will be revised to address each chemical specifically for each modeling location.                                                                                                                                                                                                                                                                                                   |                     |
| 9.a.           | Tables 2 and 4  |                | Unclear what is being presented when no location is noted, but all other columns are completed. Suggest incorporating a footnote to qualify their inclusion or deletion from the table. Some of the information has been noted within the text as not being modeled (p.4, 2.1.5), so it's inclusion in the table is another source of inconsistency in the document. | C                    | The modeling effort for these locations is within the shallow and intermediate zones for the individual site. The modeling effort will include a review of existing data to estimate the transport from the site to groundwater. The combined locations will be shown in the revised tables; e.g., for Site 12, which has two modeling locations, the model of shallow to intermediate groundwater transport for all of site 12 will be shown as "1,2" in the revised table.                                                                                        |                     |
| 9.b.           | Tables 2 and 4  |                | Suggest incorporating a field to identify the <u>type of data</u> that will be used to support the various model types presented. Information to consider capturing would be matrix, volume (no. of samples), and potentially sample IDs.                                                                                                                            | C                    | The tables will be revised to include the requested information in general terms as follows: (1) the matrix of concern, and (2) the type of data for each matrix. This information will be described as the matrix properties required as input variables for the model of choice. Because this technical memorandum outlines the approach to modeling and the numbers and identities of samples are specific to each site, the requested information will be described in the final modeling report for each site. The text will be revised to clarify this issue. |                     |

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| Comment Number                      | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                    | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | A or D <sup>2</sup> |
|-------------------------------------|-----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 9.c.                                | Tables 2 and 4  |                | Location 7 is noted on both tables, for it evaluates impacts from sites from both groups. Their protocols differ, however – and if taken to stand-alone, have redundant analyses. Edit for consistency and to minimize redundancy in the modeling efforts.                                                                                                                                                 | C                    | Because Location 7 is located near sites listed under both Group 2 and Group 4, it was listed in both tables. The Group 2 and Group 4 site designations will be dropped in the revised tables, which will remove the apparent redundancy (see responses to Comments 4 and 5).                                                                                                                                                                                                        |                     |
| 9.d.                                | Table 4         |                | Suggest adopting a footnote to identify no modeling for sites 8, 35C, 46, 48, and 50 – as was done on Table 2. Suggest briefly noting any logic that was used to support the decisions.                                                                                                                                                                                                                    | C                    | This footnote will be included in the revised tables. See response to Comments 2, 4 and 5.                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| 10.                                 | Figure 1        |                | Suggest presenting the GW flow direction for the shallow/intermediate GWs                                                                                                                                                                                                                                                                                                                                  | C                    | Agree. Groundwater flow direction will be shown in a separate figure (Figure 2) of the revised memorandum.                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Comments from Steve White (CX-HTRW) |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                            |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| 11.                                 |                 |                | There appear to be inconsistencies between the text and Tables in both Group 2 and Group 4 sites. The COCs and other thresholds are contradicted in the text and it is unclear why several compounds that are not COCs are being modeled. Please review Chapter 2 and the appropriate tables to ensure both consistency and accuracy. No chemical should be carried forward without an explicit rationale. | C                    | The tables and text will be revised as described in the responses to Comments 2, 4, and 5 to remove inconsistencies.                                                                                                                                                                                                                                                                                                                                                                 |                     |
| 12.                                 | 4.1.1 and 4.1.2 |                | A critical part of these two models is the definition of the watershed area. This is not presented and a figure must be added showing what is represented as OA in these calculations.<br><br>In addition we need to make clear where the COA                                                                                                                                                              | D                    | This technical memorandum only describes the modeling approach by giving the equations that will be used and defines the variables, such as C <sub>OA</sub> . In the modeling reports for individual sites, all the OAs and C <sub>OA</sub> values will be clearly defined.<br><br>The C <sub>OA</sub> values will be derived as defined in the equations shown in the memorandum and watershed areas determined from topological maps, which are available. The values of inorganic |                     |

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| Comment Number | Page(s)/<br>Section | Paragraph/<br>Line | Comment                                                                                                                                                                                                                                                                                                                                                                             | C,<br>D,<br>E <sup>1</sup> | Response                                                                                                                                                                                                           | A<br>or<br>D <sup>2</sup> |
|----------------|---------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                |                     |                    | values are coming from – is there in fact information on the appropriate inorganics for the watershed? If not, how do we propose to get that data – i.e. develop a statistical basis for sampling X square miles. It is impossible to evaluate the use of these two models without a clear definition of watershed area and representative values of the applicable inorganic data. |                            | concentration data, as reported in previous site characterization reports for each site, will expressed as weighted averages over the watershed areas contributing to the receptor surface water body in question. |                           |

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| Comment Number | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | A or D <sup>2</sup> |
|----------------|-----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 13.            | 4.2             |                | <p>The statement that VLEACHSM uses uniform and homogeneous hydrogeologic parameters is troubling for this site. While I do not have as much experience with LHAAP as the authors, it is my distinct impression that the vadose zone is anything but uniform and homogeneous. While this does not necessarily preclude the use of this model, it does raise red flags that need to be addressed. Either a range of conditions needs to be modeled or the parameters need to be tested in a realistic sensitivity analysis.</p> <p>These must be addressed openly in the document showing the Conceptual Site Model that is to be used so that all reviewers can adequately assess it. Building the CSM is the first critical step in all modeling exercises.</p> | C                    | <p>The vadose zone is very likely not homogeneous and isotropic. To solve this problem, either a 3-D unsaturated and saturated flow transport model, such as FEMWATER, FEFLOW or SUTRA3D can be used.</p> <p>If a 3-D model were used, detailed geologic, lithologic and hydrogeologic information would be required, which is not available for most of our sites. Even if the information were available, we still have to conceptualize the complicated condition to a simpler model that can be dealt with numerically.</p> <p>Using VLEACHSM is much simpler. A user can use many polygons (columns) at different locations and assign different values for the parameters (recharge, relative hydraulic conductivity, retardation factors, etc.) and calculate the possible concentrations contributing to groundwater concentrations at different locations, which will be inputs to the groundwater model.</p> <p>A conceptual site model will be prepared for each modeling location and described in detail in the modeling report for each location. Until the modeling approach and locations are determined, development of the conceptual site model for each LHAAP site is beyond the scope of the technical memorandum.</p> |                     |
| 14.            |                 |                | The formula to calculate the source concentration uses only one value for soil concentration. Even if every COC at every site is calculated separately using a spreadsheet calculation, it is unclear what for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | C                    | The equations and models described use single values. The input value can be the maximum, minimum, mean or any other descriptor of the concentration data. Each can have a role. A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |

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| Comment Number | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                              | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | A or D <sup>2</sup> |
|----------------|-----------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                |                 |                | instance a single concentration of arsenic or TCE at a site will give us. Taking the highest value detected will give too conservative a value and might kick you into further studies or regulatory requirements. Consider carefully and present the rationale for selecting the number used as representative or a range of numbers for each site and contaminant. |                      | modeled concentration at a down gradient receptor location based on a maximum at the source site would approximate an upper bound for the contribution of the source to the receptor. Similarly, the minimum and mean source concentrations would estimate the lower bound and most probable concentrations. Any of these estimates will be compared to actual measurements at the source or the receptor as part of the model calibration process. All of these estimates can be used in the decision process and none is intended to be the sole support for any decision. The role of the technical memorandum in decision making will be clarified in the revised memorandum. |                     |
| 15.            |                 |                | One way to avoid all the ambiguities and assumptions of the modeling exercise is to directly sample the seepage area directly - For VOCs this can be done with diffusive samplers, other compounds can be sampled by a number of techniques to collect seepage water.                                                                                                | D                    | It is true that measurement of concentrations at source locations and their down gradient receptors would avoid the assumptions of the model. Such a sampling effort could require a large expenditure of time and resources. This technical memorandum describes ways that modeling can be used to estimate whether those expenditures would be warranted.                                                                                                                                                                                                                                                                                                                       |                     |
| 16.            | 4.3             |                | Do we have the data necessary to provide the parameters in paragraph 5 that are not drawn from text books, tables or estimates of estimates? The source and quality of all of this data and how it will enable us to achieve the DQO's for this study are critical and should be included in this tech memo in concert with the CSM.                                 | C                    | The input data related to the source size, concentration, aquifer size, and hydrogeologic parameters will be obtained from records of monitoring wells described in remedial investigation reports and other reports. Other chemical specific properties, such as partition coefficients to soil-water partition coefficients (Koc) and degradation rates will be taken from the literature, i.e., they will not be measured in LHAAP soil. Dispersivity values for individual locations will be calculated based on standard American Society for Testing                                                                                                                        |                     |

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| Comment Number                          | Page(s)/Section        | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                          | A or D <sup>2</sup> |
|-----------------------------------------|------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                         |                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      | and Materials (ASTM) methods for the soil types at those locations. The types of data will be described as above in the revised technical memorandum and in more detail in the modeling report.                                                                                                                   |                     |
| 17.                                     | 4.1.1                  |                | Step 2 - The USDA source is not in the References and should be provided with the relevant date of publication.                                                                                                                                                                                                                                                                                                                                                                                          | C                    | The USDA source will be added to the reference list of the revised memorandum.                                                                                                                                                                                                                                    |                     |
| Comments from Terry L. Walker (CX-HTRW) |                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                                                                                                                                                                                                                   |                     |
| 18.                                     | Sec 2, Pg 2-4, General |                | Upon my initial read, I was confused by the apparent discrepancies between the text and Table 1. It seemed that many COCs from Table 1 were not addressed in the text. Perhaps the most confusing is the use of the terms "principal" and "primary" (to designate risk drivers). Suggest addressing all COCs in the text, separating by three categories: those with PRGs, those without PRGs (human health), and those for ecological concerns only. This comment is applicable to Group 4 sites, also. | C                    | The tables and text will be revised to clarify the apparent discrepancies. See responses to Comments 2, 4 and 5. The "principal" terminology is as used in the feasibility study reports and will be defined in the revised memorandum as the chemicals for which PRGs were developed in the feasibility studies. |                     |
| 19.                                     | Sec 2.1.1, Pg 2        |                | Suggest inserting "currently" between "compounds" and "represent" in the last sentence for clarity.                                                                                                                                                                                                                                                                                                                                                                                                      | C                    | The change will be made in the revised memorandum.                                                                                                                                                                                                                                                                |                     |
| 20.                                     | Sec. 2.1.2, Pg 2       |                | Vinyl chloride should be added to the COCs in the second sentence (per Table 1).                                                                                                                                                                                                                                                                                                                                                                                                                         | C                    | The change will be made in the revised memorandum.                                                                                                                                                                                                                                                                |                     |
| 21.                                     | Sec. 2.1.3, Pg 3       |                | Per Table 1, the listed COCs are identified as "eco only" (i.e., shaded), yet are noted here as human health concerns. Additionally, only As, Al, Ba and Tl are indicated as "fish ingestion." Please clarify.                                                                                                                                                                                                                                                                                           | C                    | Some chemicals were identified for both human health and ecological concern in previous reports. This question will be clarified in the revised memorandum (see responses to Comment 2).                                                                                                                          |                     |
| 22.                                     | Section 2.1.4, Pg 3    |                | This section indicates that hazard indices were calculated for ecological receptors. This is not a typical procedure, especially for a screening-level                                                                                                                                                                                                                                                                                                                                                   | C                    | The HQ and HI values were calculated for various indicator species at Site 16 in the reports cited in the table. The intent of the HQ and HI calculations                                                                                                                                                         |                     |

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| Comment Number                            | Page(s)/ Section | Paragraph/ Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A or D <sup>2</sup> |
|-------------------------------------------|------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                           |                  |                 | assessment, as mode of action is not understood for these receptors. Please clarify if the intent was hazard quotient (HQ), or if HIs were actually calculated. This comment applies to Section 2.2.4, also.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      | was given in the report cited.<br><br>The use of the HQ and HI values will be clarified in the revised memorandum as follows; the chemicals having the highest HQ values for which the species-specific HI was > 1 were used only to identify the chemicals of ecological concern that would be evaluated in the modeling study.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| Comments from Chris G. Villarreal (USEPA) |                  |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
| 23.                                       | Sec. 1.0, Pg 1   |                 | <p>Text states, "The purpose of this modeling effort is to calculate contaminant concentrations in soil and groundwater that, if present in these media, will not result in unacceptable human health risk in surface water and sediments at exposure points in Caddo Lake and its tributaries."</p> <p>The goal of the modeling should be to calculate contaminant concentrations in surface water and sediment based on detected contaminant concentrations in soil and groundwater. In addition to calibrating the model to reflect detected concentrations surface water and sediment, estimated future contaminant concentrations in the surface water and sediment (i.e., resulting from the migration of contaminated ground water plumes into surface water) should be also calculated. The modeled contaminant concentrations in surface water and sediment should be evaluated to determine if unacceptable risk to human health or the environment could result. If unacceptable risk to human health or the environment is determined, modeling to determine appropriate cleanup standards which will not result in unacceptable human health and environmental risks should be conducted.</p> | C                    | <p>Agree. In fact, the modeling results will provide concentrations in surface water and sediment. These calculated concentrations will be compared with measured concentrations as part of the model calibration process. The calibrated models will be then used to estimate whether concentrations might threaten human health or the environment.</p> <p>These concentrations will be used to calculate DFs, which in turn will be used to calculate ACLs based on risk-based acceptable levels (e.g. MCLs). The ACLs can be regarded as cleanup standards that will not result in unacceptable human health and environmental risks. Some of the proposed models are steady state models, which will yield conservative results. Others, such as AT123D will predict future concentrations at the points of interest. However, in order to keep the calculations simple, it is proposed to use steady state models such as Domenico's equation in most cases. Models such as AT123D may be used to predict future concentrations as warranted by site conditions. Such conditions would include chemicals or pathways that estimated to represent major contributions to health or ecological risk.</p> |                     |

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|----------------|------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 24.            | Sec. 2.1.5, Pg 3 |                | This section discusses the planned background study and that consideration of some of the subsequent modeling (i.e., for metals) will be delayed pending the results of the background study. What is the present status and estimated completion date for the background study?                                                                                                                                                                                                                                                                                                                                                                                                             | C                    | The soil background study has been completed and the draft report was submitted for Army review on February 12, 2004. This report will be submitted to regulators during the week of March 1, 2004. Background sampling of surface water, sediment, and groundwater for the study is being planned and is scheduled for the spring of 2004. |                     |
| 25.            | Sec. 2.1.5, Pg 4 |                | Text states, "Transport from groundwater to surface water and sediment will be calibrated to reflect COC concentrations detected in surface water and sediment in Harrison Bayou and Caddo Lake."<br><br>As discussed in Comment 1, in addition to calibrating transport from ground water to surface water and sediment to reflect COC concentrations detected in the surface water and sediment, estimated future contaminant concentrations in the surface water and sediment resulting from contaminated plume migration into surface water (i.e., at Site 16) should also be determined.<br><br>Text states, "... modeling locations are shown in Figure 1." Figure 1 was not provided. | C                    | Once the model is calibrated, it can be used to predict the future contaminant concentration at the points of interest (point of compliance or point of exposure) in the surface water or sediment. This use will be clarified in the revised memorandum. Figure 1 will be provided with the revised document.                              |                     |
| 26.            | Sec. 3.1, Pg 7   |                | Text states, "The ACL values for groundwater at LHAAP sites will be developed to be protective of surface water and sediment at locations off LHAAP property."<br><br>ACLs values should also be protective to human health and environmental receptors on the LHAAP property.<br><br>Text states, "Models describe in Section 4.0 will be used to develop on-site soil and groundwater                                                                                                                                                                                                                                                                                                      | C                    | Agree. Text will be modified in the revised memorandum.                                                                                                                                                                                                                                                                                     |                     |

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|------------------------------------------------------------------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                                                        |                 |                | <p>concentrations that will be protective of human receptors at exposure points in Caddo Lake and its tributaries."</p> <p>On-site soil and groundwater concentrations also need to be protective of environmental receptors at exposure points in Caddo Lake and its tributaries.</p> <p>Text states, "... the applicable ACLs will be calculated for groundwater and soil at a site ..."</p> <p>ACLs are risk-based concentration limits that can be used to establish alternate ground water protection standards. ACLs are not calculated for soil.</p> |                      | <p>Agree. Text will be modified in the revised memorandum.</p> <p>Agree. Text will be modified in the revised memorandum.</p> |                     |
| Comments from Charles D. Stone (TCEQ)                                  |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                                               |                     |
| Sec A Topsoil Concentration Protective of Surface Water and Sediments: |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                                               |                     |
| 27.                                                                    | A.1             |                | Each location at which ACLs for this model are needed should be plotted on a scaled site-wide map and on a scaled close-up map of a portion of the site-wide map. Nearby features such as ecological and/or human health receptors should be clearly resolved on the scaled detail maps.                                                                                                                                                                                                                                                                    | C                    | Agree. Location maps showing ACLs will be provided in the modeling report.                                                    |                     |
| 28.                                                                    | A.2             |                | A summary table of all model parameters and their model input values should be included with the model description. The source of each model input value also should appear on the table. All site-specific parameter input values associated with the Universal Soil Loss Equation (USLE), the Sediment Load equation (SL), and SedSoil must be referenced and explained.                                                                                                                                                                                  | C                    | Agree. All the model parameters and their model input values will be presented in tables in the modeling report.              |                     |
| 29.                                                                    | A.3             |                | Parameter input values used to calculate <sup>SW</sup> Soil should be summarized in a table that describes how                                                                                                                                                                                                                                                                                                                                                                                                                                              | C                    | Agree. See response to Comment 27.                                                                                            |                     |

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|----------------------------------------------------------------|------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                                                |                  |                 | the values were determined. Stream discharge values measurement methods should be described. The source of runoff, Kd, and all other values must be documented.                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                  |                     |
| Sec B Subsurface Soil Concentration Protective of Groundwater: |                  |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                  |                     |
| 30.                                                            | B.1              |                 | The location of each area subject to this Tier 3 modeling effort shall be clearly plotted on a site-wide map and on a scaled enlargement showing actual areas being modeled, potential receptor details (e.g., streams, ecological features, etc.) and other relevant landmarks.                                                                                                                                                                               | C                    | Agree. As mentioned in Response 28, all the input parameters will be presented in tables. The calculation of values will be explained. The sources of input values will be identified in the modeling reports for each location. |                     |
| 31.                                                            | B.2              |                 | The origin and value of all parameter input values should be fully discussed and summarized in a table with references. Field documentation for a reference pedologic section at each model location is expected. Documentation for the origin of values of Kd, foc and COC physico-chemical properties should be included. Test methods used to determine site-specific parameter values must be standardized procedures (e.g., ASTM) and be fully described. | C                    | Agree. See responses to Comments 28 through 30.                                                                                                                                                                                  |                     |

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|----------------------------------------------------------------------------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 32.                                                                              | B.3             |                | Each VLEACH simulation must have a summary table of variable values for the Simulation Data and the Polygon Data. Justification of the values should be included. VLEACH runs should progress with sufficiently small timesteps to resolve meaningful trends and with a sufficiently long simulation length to reach steady state.<br><br>Actual printouts of the results of each simulation run should be included in an Appendix. A summary of each VLEACH run should be presented in a table form within the body of the discussion. The predicted groundwater concentrations through time for each simulation location should be plotted and presented in the discussion. | C                    | Agree. All values will be included in the modeling report.                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| Sec C Groundwater Concentration Protective of Surface Water ( <sup>GW</sup> SW): |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| 33.                                                                              | C.1             |                | LHAAP indicates it will use AT123D to perform long-term flow and transport modeling of groundwater and its interaction with surface water bodies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | C                    | Yes, AT123D will be used to perform fate and transport of contaminants where necessary. However, when geologic and hydrogeologic data permit and clearly indicate uniformity or homogeneity in the modeled area, a simpler approach using Domenico's equation will be used to calculate the DFs and the subsequent ACLs. The interaction of groundwater with surface water will be reflected in the calculation of dilution in the streams. |                     |
| 34.                                                                              | C.2             |                | LHAAP should develop a site-wide flow model whose domain encompasses the entirety of the base and include all adjacent water bodies and potential receptors. The flow model must be fully calibrated, verified and validated prior to performing any transport modeling.                                                                                                                                                                                                                                                                                                                                                                                                      | D                    | Development of a site-wide flow model requires a full 3-D model. Until such time when all the required data are available and budget is justified, consideration of such a model is premature. The proposed model would have to be calibrated but due to lack of data, verification and validation of model may not be possible at this time. It is possible that such a model has been made for the                                        |                     |

1. Respondent Concurs (C), Does not concur (D), or takes Exception (E).
2. Commenter Agrees (A) with response, or Does not agree (D) with response.

Response to Comments on  
Draft Technical Memorandum: Modeling Approach for Derivation of Soil and Groundwater Concentrations Protective of Surface Water and Sediment  
October 2003

Contract No. DACA56-94-D-0020, Delivery Order No. 0109  
Longhorn Army Ammunition Plant, Karnack, Texas

Response Date: February 25, 2004

**Reviewers:** Cheryl Groenjes (CX-HTRW), Steve White (CX-HTRW), Chris Villarreal (USEPA), Charles D. Stone (TCEQ), Wilma Subra (TAG)

| Comment Number | Page(s)/ Section | Paragraph/ Line | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                       | A or D <sup>2</sup> |
|----------------|------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|                |                  |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      | LHAAP site. If so, it will be used as appropriate to this purpose.                                                                                                                                             |                     |
| 35.            | C.3              |                 | The domain hydrogeology should be described in detail using available subsurface data. Hydrostratigraphy, aquifers, hydraulic divides, zones of saturation, stratigraphic variations, hydraulic interconnectivities, surface water interactions, appropriate boundary conditions, etc. must be identified and described completely. Assignment of all hydrogeologic parameter values must be validated and described. A summary table of all model parameter values should be presented.                            | C                    | Agree. The description of hydrogeology using the available data will be presented in the modeling report to the extent that it supports the models used.                                                       |                     |
| 36.            | C.4              |                 | The flow model must be fully calibrated. Details of the calibration process should be described. Starting parameter values and calibrated values must be listed for comparison. Calibration statistics are expected.                                                                                                                                                                                                                                                                                                | D                    | A flow model is not planned at this time. See response to Comment 34.                                                                                                                                          |                     |
| 37.            | C.5              |                 | The transport modeling should proceed only after the flow model has been calibrated, verified and validated. The transport model should account for all known contaminant sources, including those identified in Sec B. The maximum groundwater contaminant concentrations calculated from the VLEACH modeling in Sec B must be used as continuous source concentrations in the AT123D model. The continuous source concentrations must be incorporated into the AT123D model at each respective modeling location. | D                    | A flow model is not planned at this time. See response to Comments 34 and 35. The results of VLEACHSM will be considered as continuous source concentration in the AT123D model or in the Domenico's equation. |                     |
| 38.            | C.6              |                 | AT123D should be used to report the maximum predicted concentrations of each COC plume that contacts surface water bodies at the groundwater-surface water interface. Similarly, the maximum dissolved COC concentrations should be reported at all other points of exposure and potential receptors (e.g., wet lands, etc.).                                                                                                                                                                                       | C                    | Agree.                                                                                                                                                                                                         |                     |

1. Respondent Concurs (C), Does not concur (D), or takes Exception (E).
2. Commenter Agrees (A) with response, or Does not agree (D) with response.



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| Comment Number                  | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                                                                                                               | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                             | A or D <sup>2</sup> |
|---------------------------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 39.                             | C.7             |                | All transport model inputs should be described in the text and summarized in a table.                                                                                                                                                                                                                                                                                                                 |                      | See responses to Comments 28 and 29.                                                                                                                                                                                                                                                                 |                     |
| 40.                             | C.8             |                | AT123D output should be described individual for each dissolved COC plume within the model domain and all modeled groundwater plume-surface water body interaction should be discussed in detail using scaled maps and isoconcentration lines. All AT123D output data should be organized and summarized in the text. All actual AT123D output data should be organized and annotated in an Appendix. | C                    | Agree. These will be provided in the modeling report.                                                                                                                                                                                                                                                |                     |
| 41.                             | C.9             |                | Dilution factors applied to groundwater at the surface water interfaces should be calculated at each interface location using the methods described in TRRP 24 (Determining PCLs for Surface Water and Sediment). Dilution factors should be calculated separately for each individual groundwater-surface water interface location. Discussion and calculations of each dilution factor is expected. | C                    | Agree. See the TCEQ, 2002 reference cited on page 14 of the technical memorandum. Calculation of each DF will be provided in the modeling report.                                                                                                                                                    |                     |
| Comments from Wilma Subra (TAG) |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                                                                                                                                                                                                      |                     |
| 42.                             | Pg. 2           |                | Chemicals of Concern at Group 2 Sites, Section 2.1-fails to list Site 16 in the first sentence.                                                                                                                                                                                                                                                                                                       | C                    | Agree. The corrections will be made in the revised technical memorandum.                                                                                                                                                                                                                             |                     |
| 43.                             | Pg. 2           |                | Summary of Chemicals of Concern at Group 2 Sites, Section 2.1.5-some of the Group 2 sites (29, 32, and 49) are in the Goose Prairie Creek drainage. The section only addresses Harrison Bayou and Caddo Lake.                                                                                                                                                                                         | C                    | The information in this section and the associated tables was taken from previous baseline risk assessments and feasibility studies. These tables will be changed in the revised technical memorandum to clarify the sources and down gradient receptor areas. See responses to Comments 2, 4 and 5. |                     |

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2. Commenter Agrees (A) with response, or Does not agree (D) with response.

Response to Comments on  
Draft Technical Memorandum: Modeling Approach for Derivation of Soil and Groundwater Concentrations Protective of Surface Water and Sediment  
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| Comment Number | Page(s)/Section | Paragraph/Line | Comment                                                                                                                                                                                                                                                                                                | C, D, E <sup>1</sup> | Response                                                                                                                                                                                                                                                                                              | A or D <sup>2</sup> |
|----------------|-----------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 44.            | Pg. 4           |                | Groundwater COC's, Third paragraph - the trinitrotoluene production residues have been documented as running off of Site 29 during rainfall events and flowing into Goose Prairie Creek. This section does not address the runoff into Goose Prairie Creek. The section only considers Harrison Bayou. | C                    | The information describing Site 29 as a source was taken from previous baseline risk assessments and feasibility studies. The information on TNT residue runoff into Goose Prairie Creek will be included in the modeling at locations 8 and 9 shown in Figure 1 of the revised technical memorandum. |                     |
| 45.            | Pg. 8           |                | Topsoil Concentrations Section 4.1 Line 9 Change Section 4.1 to Section 4.1.1.                                                                                                                                                                                                                         | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |
| 46.            | Pg. 8           |                | Topsoil Concentration Section 4.1 Line 10 Change Section 4.2 to Section 4.1.2.                                                                                                                                                                                                                         | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |
| 47.            | Pgs. 18-21      |                | Table 1. Add Site 16 to the list of sites in the title.                                                                                                                                                                                                                                                | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |
| 48.            | Pg. 22          |                | Table 2 make the list of sites and water bodies in the title correspond to those addressed in the Table.                                                                                                                                                                                               | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |
| 49.            | Pgs. 23-26      |                | Table 3 make the list of sites in the title correspond to those addressed in the Table.                                                                                                                                                                                                                | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |
| 50.            | Pg. 27          |                | Table 4 make the list of sites and water bodies in the title correspond to those addressed in the Table.                                                                                                                                                                                               | C                    | This change will be made in the revised technical memorandum.                                                                                                                                                                                                                                         |                     |

1. Respondent Concurs (C), Does not concur (D), or takes Exception (E).  
2. Commenter Agrees (A) with response, or Does not agree (D) with response.





Shaw Environmental & Infrastructure, Inc.

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March 26, 2004

Mr. Andy Obrochta  
U.S. Army Corps of Engineers – Tulsa District  
1645 South 101<sup>st</sup> - East Avenue  
Tulsa, Oklahoma 74128-4629

RE: **Task Order No. 109**  
Total Environmental Restoration Contract (TERC)  
Contract No. DACA56-94-D-0020  
Environmental Investigation and Remediation at  
Longhorn Army Ammunition Plant, Karnack, Texas  
***Submittal of Final Technical Memorandum, Modeling Approach for Derivation  
of Soil and Groundwater Concentrations Protective of Surface Water and  
Sediment, Longhorn Army Ammunition Plant, Karnack, Texas***

Dear Mr. Obrochta:

Shaw Environmental, Inc. is pleased to provide 14 copies of the referenced document for your review and distribution. Also attached are compact disks with an electronic version of the document.

Please contact me if you have any questions or require additional information.

Sincerely,

Praveen Srivastav, Ph.D., P.G.  
Deputy Project Manager/  
Technical Lead



**FINAL  
TECHNICAL MEMORANDUM**

**MODELING APPROACH FOR  
DERIVATION OF SOIL AND GROUNDWATER CONCENTRATIONS  
PROTECTIVE OF SURFACE WATER AND SEDIMENT  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS**

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**Prepared for  
U.S. Army Corps of Engineers  
Tulsa District**

**Prepared by  
Shaw Environmental, Inc.  
1430 Enclave Parkway  
Houston, Texas 77077**

**Contract Number DACA56-94-D-0020  
Task Order No. 0109**

**March 2004**



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## Acronyms and Abbreviations

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|                      |                                                |
|----------------------|------------------------------------------------|
| ACL                  | alternate concentration limits                 |
| COC                  | chemical of concern                            |
| DDT                  | dichloro-diphenyl-trichloroethane              |
| DF                   | dilution factor                                |
| ft <sup>3</sup> /sec | cubic feet per second                          |
| k/yr                 | kilograms per year                             |
| LHAAP                | Longhorn Army Ammunition Plant                 |
| MCL                  | maximum contaminant level                      |
| mg/kg                | milligrams per kilogram                        |
| mg/L                 | milligrams per liter                           |
| MSC                  | medium specific concentration                  |
| NOAEL                | no observed adverse effect level               |
| PAH                  | polyaromatic hydrocarbon                       |
| PCB                  | polychlorinated biphenyl                       |
| STEP                 | Solutions to Environmental Problems, Inc.      |
| TCEQ                 | Texas Commission of Environmental Quality      |
| TNT                  | trinitrotoluene                                |
| USEPA                | U.S. Environmental Protection Agency           |
| USLE                 | Universal Soil Loss Equation                   |
| VLEACHSM             | Vadose Zone Leaching and Saturated Zone Mixing |
| VOC                  | volatile organic compound                      |



## 1.0 Purpose and Scope

This memorandum describes the approach for modeling the fate and transport of chemicals from sites at Longhorn Army Ammunition Plant (LHAAP) to surface water and sediments in the bayous and creeks within LHAAP that flow into Caddo Lake. Specifically, the sites include Sites 04, 08, 12, 16, 17, 18/24, 29, 32, 35A, 35B, 35C, 46, 47, 48, 49, 50, 60, and 67. The modeling approach is discussed for chemicals of concern (COCs) at LHAAP. These COCs were identified by others as representing potentially unacceptable risk to humans or ecological receptors (Jacobs Engineering Group, Inc. [Jacobs], 2001a,b,c; 2002a,b,c,d). The purpose of this study is to apply analytical models to estimate the transport of chemicals from LHAAP soil and groundwater to surface water bodies that flow into Caddo Lake. The models will be calibrated by comparing estimated concentrations with measured concentrations in surface water and sediment in Caddo Lake and its tributaries. The calibrated models will then be used to calculate contaminant concentrations in soil and groundwater that, if present in these media at LHAAP sites, will not result in unacceptable human health risk or ecological hazard in surface water and sediments at exposure points in Caddo Lake and its tributaries.

The following text identifies contaminants, sources, transport media and receptor bodies that are proposed as subjects of the modeling effort. The text also summarizes the proposed analytical models to be used for calculating protective concentrations in site media.

## 2.0 Target Chemicals of Concern

Chemicals of concern are identified in the baseline risk assessments for Group 2 Sites (Jacobs, 2002a) and Group 4 Sites (Jacobs, 2002b), and for Site 16 (Jacobs, 2001a,b) (see **Figure 1**). Additional information was obtained from the feasibility study reports for Group 2 (Jacobs, 2002c) and Group 4 (Jacobs, 2002d) sites, and for Site 16 (Jacobs, 2001c). Because the grouping of LHAAP sites into Groups 2 and 4 does not reflect their geographic locations or their drainage pathways, the LHAAP sites are addressed herein by site number and not by group number.

The fate and transport of the COCs present in the soil and groundwater to surface water and sediments of creeks and bayous will be the subject of the proposed modeling effort. Transport of COCs in surface water to downgradient locations on site and off site (Caddo Lake) will also be modeled.

Potential on-LHAAP exposures of current trespassers and future maintenance workers were evaluated previously for the following pathways (Jacobs, 2002a,b):

- Ingestion, dermal absorption, and inhalation of dust and vapors by adults were evaluated for chemicals in the soil
- Ingestion of groundwater used as drinking water
- Dermal contact and inhalation of vapors from groundwater while showering
- Incidental ingestion of sediment, dermal contact with surface water and sediment, and ingestion of recreationally caught fish were evaluated for surface water and sediment at locations potentially affected by LHAAP operations

Off-LHAAP exposures of adult and child residents to surface water and sediment in Caddo Lake assumed the use of surface water as a domestic drinking water supply as well as for recreation. Therefore, exposures to surface water and sediment were assessed for:

- Surface water ingestion and dermal contact by showering
- Incidental surface water and sediment ingestion
- Dermal contact with surface water and sediment
- Ingestion of recreationally caught fish

Additional COCs were identified in the screening ecological risk assessments for selected indicator species (Jacobs, 2002a,b). Chemicals to be included in the modeling effort are designated as Target COCs in this memorandum.

## 2.1 Chemicals of Concern at LHAAP Sites

The affected media and COCs that were identified in human health risk assessments (Jacobs, 2002a,b) are summarized in **Table 1**. The COCs estimated to pose a cancer risk greater than  $1E-04$  or a noncancer Hazard Index greater than 1 in soil, groundwater, surface water, or sediment, or are above a maximum contaminant level (MCL) value (Jacobs, 2002c,d), are identified by an "X" in **Table 1**. The COCs estimated to pose a cancer risk within the acceptable  $1E-06$  to  $1E-04$  range are identified by an "O" in **Table 1**. Perchlorate is identified as a Target COC for modeling at some sites based on more recent data (Solutions to Environmental Problems, Inc. [STEP], 2003) or concern expressed in stakeholder meeting minutes (LHAAP, 2002, 2003a, 2003b).

Typically, only those chemicals that are either COCs for specific media or exceed a maximum contaminant level (MCL) or equivalent standard will be designated as Target COCs for modeling. When selecting Target COCs, consideration will also be given to the proportion of risk contributed by each COC. COCs contributing to the majority of the risk will likely drive screening of remedial alternatives during feasibility studies and the modeling of these chemicals would be the most cost effective approach.



### 2.1.1 Surface Soil

Soils sampled at Sites 04, 08, 12, 16, 18/24, 29, 35A, 35B, 35C, 46, 47, 48, 49, and 67 did not contain COCs at concentrations that pose unacceptable health risk to future maintenance workers or current trespassers (Jacobs, 2002a,b). No human health risk estimate was made for any medium at Site 60 (Jacobs, 2002a).

Soil at Sites 17 and 32 contained several COCs that represent unacceptable risks to future maintenance workers or current trespassers. Because 2,4-dinitrotoluene, 2,6-dinitrotoluene, and 2,4,6-trinitrotoluene in soil at Site 17, and 2,4,6-trinitrotoluene in soil at Site 32 were determined to represent the principal sources of potential health risk, preliminary remediation levels were developed for these chemicals in soil by Jacobs (2002c).

### 2.1.2 Groundwater

Groundwater at Sites 04, 08, 12, 16, 17, 18/24, 29, 32, 35A, 35B, 35C, 46, 47, 48, 50, and 67 (Jacobs, 2002a,b) contained COCs at unacceptable levels for trespassers or future maintenance workers (**Table 1**). The organic COCs are trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, 1,2-dichloroethane, 1,1-dichloroethene, vinyl chloride, methylene chloride, chloroform, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, dioxins, and acetone. The inorganic COCs that represent unacceptable human health risks or exceed drinking water standards are perchlorate, aluminum, antimony, arsenic, cadmium, manganese, nickel, silver, thallium, and tin.

Of these compounds, trichloroethene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, perchlorate, cis-1,2-dichloroethene, 1,2-dichloroethane, 1,1-dichloroethene, vinyl chloride, methylene chloride, chloroform, perchlorate, and tetrachloroethene represent potential health risk, and preliminary remediation levels were developed for these COCs in groundwater by Jacobs (2002c,d). Preliminary remediation levels were also calculated for metals by Jacobs (2002a,b,c,d).

### 2.1.3 Surface Water and Sediment

Surface water and sediments did not contain COCs at unacceptable levels for current trespassers or future residents at Central Creek, Saunder's Branch, Goose Prairie Creek, Harrison Bayou and Caddo Lake (Jacobs, 2002a,b). Cancer risks and noncancer hazards above acceptable limits (Jacobs, 2002a,b) were associated with potential exposure to arsenic, aluminum, barium, cadmium, manganese, mercury, silver, thallium, vanadium, dioxins, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)anthracene by ingestion of fish from Central Creek, Saunder's Branch, Goose Prairie Creek, Harrison Bayou, or Caddo Lake (**Table 1**).

## 2.1.4 Ecological Chemicals of Concern

Potential effects of exposures of ecological receptors to chemicals at LHAAP sites were evaluated using the Hazard Indices developed for the screening level environmental risk assessment (Jacobs, 2002a,b). The affected media and COCs that were identified in screening level ecological risk assessments (Jacobs, 2002a,b) are summarized in **Table 2**. The COCs with maximum concentrations above ecological benchmark criteria in soil, surface water, or sediment are identified by an "X" in **Table 2**. Ecological COCs that are also human health COCs are identified in **Table 2** by an "H."

The COCs exceeding ecological benchmarks for terrestrial and aquatic indicator species (Jacobs, 2002a,b) are aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, chrysene, cobalt, copper, fluoranthene, iron, lead, manganese, mercury, nickel, phenanthrene, selenium, silver, thallium, tin, vanadium, zinc, 2,4,6-trinitrotoluene (TNT), Arochlor 1254 (polychlorinated biphenyls [PCBs]), and 4,4'-dichloro-diphenyl-trichloroethane (DDT) (**Table 2**). These chemicals were associated with one or more of the soil, surface water, or sediment media of concern to ecological receptors. Certain ecological COCs present in soil, surface water, or sediment at a site are also present in the groundwater at the site. These COCs are marked in a separate column for groundwater in **Table 2** to show a groundwater-to-surface water/sediment pathway, where it exists.

Most of the chemicals with elevated Hazard Indices are metals (Jacobs, 2002a,b). Metals often exhibit elevated Hazard Indices at the screening-level stage due to very conservative assumptions inherent in screening level ecological risk assessments. Some of this conservatism results from the use of highly conservative "no observed adverse effect level" (NOAEL) values for ecological benchmark screening. Many NOAELs are based on toxicity test protocols that do not reflect conditions that are likely to occur in the natural environment. For example, toxicity studies used to develop NOAELs often specify administration of dissolved metals in water, which represents a source that is 100 percent bioavailable to the test organism. Also, the protocol often specifies the administration of a metal in its most toxic form (e.g., methyl mercury), tests the most sensitive receptor (or life-stage of the receptor), or both.

Metal concentrations measured in LHAAP media by the analytical laboratory represent total recoverable metals without chemical speciation. A comparison of these total concentrations to conservative ecological benchmarks, which are often based on the most toxic and bioavailable form of the metal, represents a worst-case scenario that tends to increase the number of chemicals identified for ecological concern.

It is likely that most of the metals identified in **Table 2** are associated with background concentrations. It is also likely that the metals exhibit lower toxicity in the LHAAP environment than their Hazard Indices indicate, because they are sequestered in non-bioavailable forms in the



media, are metabolized by the organism (sequestered/excreted), or are present in chemical forms that have much lower toxicity than those administered in the toxicity tests used to derive the ecological benchmarks values.

### **2.1.5 Target Chemicals of Concern Selected for Modeling**

No COCs had concentrations in soil, groundwater, surface water, or sediment above the risk-based selection criteria at Sites 04, 08, 49, or 60 (**Table 1**). No human health risk estimate was made for perchlorate at Site 04; however, perchlorate was selected as a Target COC for modeling based on later studies (STEP, 2003). No human health risk estimate was made for any chemical at Site 60 (Jacobs, 2002a,b).

No metals were identified as Target COCs in soil, surface water, or sediment (**Table 1**). Metals were identified as Target COCs in groundwater for potential human health effects at Sites 29, 35A, 35B, 35C, 46, 47, and 48. Numerous metals were identified as Target COCs as a result of the potential for human ingestion of fish from Central Creek, Saunder's Branch, Harrison Bayou, and Caddo Lake (**Table 1**).

Dioxins were identified as human health COCs in soil or groundwater at Sites 04, 08, 12, 16, 17, 18/24, 32, 35A, 35B, 35C, 47, 48, 49, and 50 (**Table 1**), with risk within acceptable limits. Dioxins were identified as COCs in fish from Goose Prairie Creek, Harrison Bayou, and Caddo Lake (**Table 1**). However, dioxins exceeded acceptable criteria only in Harrison Bayou and Caddo Lake. Dioxins were not identified as Target COCs for metals as explained below.

Polyaromatic hydrocarbons (PAHs) were identified as human health COCs in soil at Site 35A, 35B, 46, 47, 48, and in sediment and fish from Caddo Lake. Only PAHs in fish from Caddo Lake were above the acceptable risk criteria (**Table 1**). Arochlor 1254 (a PCB) was identified as an ecological COC at Sites 35A and 46, 4-4-DDT at Site 46, and fluoranthene at Site 29 (**Table 2**).

Because metals, dioxins, PCBs, pesticides, and PAHs are subjects of an installation-wide background study (Shaw, 2004), no transport modeling of these compounds from soil to groundwater and transport via groundwater to surface water and sediment will be performed until the final results of the background study are available. Likewise, no modeling of these chemicals in surface soil runoff to surface water will be performed until the background study is completed.

### **Soil**

The Target COCs identified in soil (Jacobs, 2001c; 2002c,d; and marked with an "X" in **Table 1**) are 2,4,6-trinitrotoluene, 2,6-dinitrotoluene, and 2,4-dinitrotoluene, which occur at Sites 17 and 32. These compounds were not identified in groundwater, surface water, or sediment at Harrison

Bayou or Caddo Lake (**Table 1**). However, potential leaching of these COCs from soil to groundwater will be modeled and the models will be calibrated to reflect low or undetected COC concentrations in surface water and sediment in Harrison Bayou and Caddo Lake.

### Groundwater

The volatile organic Target COCs identified in groundwater are trichloroethene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, cis-1,2-dichloroethene, 1,2-dichloroethane, 1,1-dichloroethene, vinyl chloride, methylene chloride, chloroform, and tetrachloroethene. These chemicals are associated with one or more of the following LHAAP Sites: 12, 16, 17, 18/24, 29, 35A, 35B, 47, 50, or 67.

Trichloroethene and 1,1-dichloroethene were identified as COCs in surface water or sediment of Harrison Bayou or Caddo Lake, and vinyl chloride was identified as a COC in fish from Goose Prairie Creek and Caddo Lake. These chemicals were not identified as posing a cancer risk above 1E-04 or a noncancer Hazard Index above 1 (**Table 1**). Because of the concern expressed by the LHAAP project team regarding mixing between the shallow and intermediate groundwater zones and transport to surface water bodies (LHAAP, 2002, 2003a, 2003b), groundwater transport of these volatile organic compounds (VOCs) among shallower groundwater zones will be modeled. The models will be calibrated using available data from wells in the shallow and intermediate zones at each site, and will be modified using data from additional wells as it becomes available. Transport from groundwater to surface water and sediment will be calibrated to reflect COC concentrations detected in surface water and sediment in Harrison Bayou and Caddo Lake.

Perchlorate has been identified as a groundwater Target COC at Sites 04, 12, 16, 17, 18/24, 29, 35A, 46, 47, 48, and 50. Because of the results of the plant-wide perchlorate investigation (STEP, 2003), groundwater transport among the shallower zones will be modeled, as will transport from groundwater to surface water and sediment in Central Creek, Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Caddo Lake.

Residues from TNT production (2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, 2,4-dinitrotoluene, and 2,6-dinitrotoluene) were identified as groundwater Target COCs associated with Site 29. The Target COCs at Site 47 were identified as 2,4-dinitrotoluene and 2,6-dinitrotoluene. None of these compounds were identified as COCs in surface water or sediment of Central Creek, Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Caddo Lake, but 2,6-dinitrotoluene was identified as a COC in fish from Goose Prairie Creek (**Table 1**). However, transport of these COCs from groundwater to downstream surface water and sediment will be modeled and the models will be calibrated to reflect the low or undetected concentrations in the above surface water bodies.



Bis(2-ethylhexyl)phthalate or di-n-butylphthalate was measured at low concentrations in groundwater at Sites 12, 35A, and 47 and in surface water at Goose Prairie Creek (**Table 1**). Because the estimated risk associated with exposure to groundwater is within the acceptable range, phthalates were not identified in previous reports as principal COCs or as targets for remediation (Jacobs, 2002c,d). However, unacceptable human health risks were associated with ingestion of bis(2-ethylhexyl)phthalate or di-n-butylphthalate in fish from Goose Prairie Creek and Caddo Lake (**Table 1**). Therefore, the modeling approach will include these two phthalates as Target COCs.

Proposed models, media, and transport pathways are listed in **Table 3**; modeling locations are shown in **Figure 1**. The general groundwater flow direction is shown in **Figure 2**.

### **3.0 Development of Protective Media-Specific Concentrations for Target Chemicals of Concern**

Analytical equations and computer models will be used to calculate concentrations of Target COCs during their migration through various environmental media to exposure points in the surface water bodies. Specific media to be modeled and models to be used would depend upon the contaminated source medium and anticipated pathway of contaminant migration. For example, pathways to be modeled for transport of contaminants from a contaminated soil source would include: (a) erosion of soil and transport to surface water; (b) leaching of contaminants to groundwater; (c) transport and dilution of contaminants by groundwater until discharge to surface water; (d) transport and dilution by surface water; and (e) transport by sediments.

The modeling effort would yield a dilution factor (DF) for a contaminant between the location of the contaminated source medium and an exposure point in the surface water. The DF may be used to back-calculate onsite media specific concentrations (MSCs) based on applicable standards or risk-based remedial goals at the exposure point. MSCs for groundwater are also called alternate concentration limits (ACLs). ACL calculations are discussed in a separate section below because they are expected to be a major portion of this modeling effort.

The calculation will include calibration of models. This calibration will involve estimation of chemical concentrations at downgradient locations based on the characteristics of the source, and comparison of the estimates with measured concentrations downgradient. Appropriate changes will be made to the model until it agrees with actual measurements. When calibrated, the model will be used to calculate MSCs that will be protective of human and ecological receptors at other locations, even those where no actual concentrations have been measured.

### 3.1 *Alternate Concentration Limits*

Conditions for development of ACLs for compliance with Texas Commission of Environmental Quality (TCEQ) regulations are described in 30TAC§335.160. The ACL values for groundwater at LHAAP sites will be developed to be protective of surface water and sediment at locations both on and off LHAAP property. Procedures described in Texas Risk Reduction Standards (30TAC§335.551-335.569) and associated TCEQ memoranda and updates (TNRCC, 1998) will be used as guidance for calculation of soil MSCs.

Models described in **Section 4.0** will be used to develop on-site soil and groundwater MSCs that will be protective of human receptors at exposure points in Caddo Lake and its tributaries. For example, a groundwater transport model will be used to estimate migration of Target COCs in groundwater from a site to a potential location of discharge to surface water and sediment, so as to protect human and ecological users of the surface water body. The modeling results will include a DF that will be used to multiply the applicable surface water standard (such as an MCL, if appropriate) to develop a groundwater ACL. (The DF is a unitless value that can be assumed to have the units of milligrams per liter [mg/L] in the source groundwater per mg/L in downgradient groundwater or surface water.) Applicable surface water standards would include TCEQ ecological benchmarks for water quality or, in the absence of a TCEQ benchmark for a chemical, the federal national ambient water quality criteria, MCL, or interim action level.

The resulting groundwater ACL will be interpreted as the groundwater concentration at a compliance point on site or at an off-site downgradient location that will be protective of surface water users farther downgradient, both on and off the LHAAP.

Groundwater ACLs to be developed for Target COC transport to sediments will be based on a sediment concentration calculated according to the assumptions of the human health and screening ecological risk assessments (Jacobs, 2002a,b). In this example, two groundwater ACLs will be developed; one to protect humans exposed to surface water and a second for potential human exposure to sediment. These two groundwater ACLs will be specific to the site, transport pathway, receptor surface water body, and COC. The more stringent of the two ACLs will be designated as the applicable ACL for groundwater at the site.

## 4.0 *Proposed Analytical Models*

This section describes four analytical models proposed for calculation of protective levels in various media. These include contaminant migration from (1) topsoil to sediments, (2) surface soil to surface water, (3) subsurface soil to groundwater, and (4) groundwater to the surface water.



## 4.1 Surface Soil Concentration Protective of Surface Water and Sediments

Contaminants released on the land surface are retained between the pore spaces of topsoil, adsorbed on soil particles, or leaked into subsurface soil. Contaminated soil particles will be transported by storm-generated runoff to a nearby stream or depression (e.g., lake, pond, etc.). The approach to develop surface soil concentrations protective of sediment is described in **Section 4.1.1**. The approach to develop surface soil concentrations protective of surface water in streams is described in **Section 4.1.2**.

### 4.1.1 Screening Calculation for MSC-Soil-Sediment

A screening calculation is proposed to evaluate whether storm water from an affected property has the potential to pose a risk to human or ecological receptors in an adjacent receiving water body. This approach provides a calculated MSC for soil to sediment pathway (MSC-Soil-Sediment) that is protective of sediment for the soil runoff pathway. This MSC value can be used to evaluate the COC in erodable soil at the affected property.

The following procedures show how the MSC-Soil-Sediment is calculated:

#### Step 1: Calculate soil loss using Universal Soil Loss Equation (USLE)

The U.S. Soil Conservation Service developed the USLE. This USLE is empirical and is based on statistical relationships that support its universal applicability. The revised USLE is in the form:

$$A = R * K * L_s * C * P$$

where:

- A = Estimated average annual soil loss (kg/acre-yr)
- R = Rainfall-runoff erosivity factor (unitless)
- K = Soil-erodibility factor (unitless)
- L<sub>s</sub> = Topographic factor (unitless)
- C = Cover-management factor (unitless)
- P = Support practice factor (unitless)

All the independent variables (R, K, L<sub>s</sub>, C, and P) can be determined using U.S. Environmental Protection Agency (USEPA) guidance (1985) and other publicly available sources.

#### Step 2: Calculate the Delivery Ratio and Sediment Load

After the estimated annual soil loss (A) is calculated, a delivery ratio must be used to localize this number for a specific affected property to estimate the sediment load.

Several processes occur within an affected property that inhibit eroded material from reaching the watershed outlet including, redeposition in surface water storage, trapping by vegetation and plant residues, and local scour and redeposition in rills and channels. Other factors influencing the eroded material transport are climate, soil particle size and texture, size and proximity of the upland erosion source, the ratio of rill versus sheet erosion, total watershed area, watershed length and relief, and drainage density. The following equation should be used to calculate the sediment load for the area of interest:

$$SL = A * DR$$

where:

- SL = Sediment load (kg/acre-yr)
- A = Estimated average annual soil loss (kg/acre-yr)
- DR = Delivery ratio (from graphs provided by the U.S. Department of Agriculture (Wischmeier and Smith, 1978) or USEPA (1985) guidance

### Step 3: Calculate MSC-Soil-Sediment

The MSC-Soil-Sediment (or  $C_{AP}$ ) is calculated using the following equation:

$$C_{AP} = \frac{(SL_{TOT} * C_{TOT}) - (SL_{OA} * C_{OA})}{SL_{AP}} = \text{MSC - Soil - Sediment}$$

where:

- $C_{AP}$  = MSC-Soil-Sediment (milligrams per kilogram [mg/kg]) for the soil-to-surface runoff pathway
- $SL_{TOT}$  = Total sediment load estimated for the entire contributing watershed (kilograms per year [kg/yr]) (see Step 2)
- $C_{TOT}$  = COC sediment MSC that is protective of human or ecological receptor at the receiving water body (mg/kg)
- $SL_{OA}$  = Sediment load (kg/yr) estimated for other areas of the watershed (see Step 2)
- $C_{OA}$  = Background soil concentration for the COC (mg/kg) (Shaw, 2004)
- OA = The contributing watershed other than the affected area
- $SL_{AP}$  = Sediment load from the affected property (see Step 2) (kg/yr)

The  $C_{OA}$  values will be expressed as weighted averages over the watershed areas contributing to the receptor surface water body in question. Watershed areas will be determined from topological maps or the results of previous hydrology studies, if available. Weighting factors will be described by the relative watershed areas of affected area and the other areas (OA, above).



When the  $C_{AP}$  value is calculated, it will be compared with the affected property surface soil concentration to determine if the erodable soil concentrations exceed the MSC-Soil-Sediment.

#### 4.1.2 Screening Calculation for MSC-Soil-Surface Water

This modeling approach provides a calculated MSC for soil-to-surface water pathway (MSC-Soil-Surface Water) that is protective of surface water for the soil runoff pathway to flowing watercourses. The sediment load to the surface water body, calculated using the USLE and delivery ratio approaches (Section 4.1.1) will be used to estimate the sediment load on surface water during average flow conditions. An equilibrium partitioning approach is used subsequently to estimate the greatest potential effect on the water body.

The equation used to estimate the COC concentration in runoff from the affected property is:

$$C_{AP} = \frac{Q_D * C_D - Q_{OA} * C_{OA}}{Q_{AP}}$$

where:

- $C_{AP}$  = Concentration of the COC in runoff water from the affected property (mg/L)
- $Q_D$  = Flow downstream of the affected property watershed (cubic feet per second [ft<sup>3</sup>/sec])
- $C_D$  = Concentration of the COC downstream of the affected property (mg/L)
- $Q_{OA}$  = Runoff from other areas of the affected property watershed (ft<sup>3</sup>/sec)
- $C_{OA}$  = Concentration of the COC in runoff from other areas of the affected property watershed (mg/L)
- $Q_{AP}$  = Runoff from the affected property (ft<sup>3</sup>/sec)

When the COC concentration downstream of the affected property ( $C_D$ ) is equated to the appropriate risk-based exposure level or regulatory standard for surface water, the resulting  $C_{AP}$  represents the risk-based COC concentration in the receiving surface water.

Assuming that the dissolved COC in the affected property runoff is in equilibrium with the solid-phase ( $C_{soil}$ ), then the concentration in the solid-phase  $C_{soil}$  (mg/kg) is:

$$C_{soil} = \frac{K_d * (Q_D * MSC_{SW} - Q_{OA} * C_{OA})}{Q_{AP}} = MSC - Soil - Surface Water$$

where:

- $K_d$  = Soil to water partition coefficient for the COC (unitless). The dimensional integrity of this

equation is maintained by assuming the density of water is 1 kg/L

$MSC_{SW}$  = Published or risk-based MSC of surface water protective of human or environmental receptors, as appropriate (mg/L)

$MSC_{\text{Soil-Surface Water}}$  = Affected property soil MSC protective of surface water exposure in the receiving surface water body (mg/kg)

Other variables are defined as above.

The calculation of runoff rates and volumes will be based on the Schueler Method (Schueler, 1987). First, the runoff coefficient for each land use type will be derived with the following equation:

$$R_{VU} = 0.05 + (0.009 * I_U)$$

where:

$R_{VU}$  = Runoff coefficient (unitless) for land use type U ( $\text{inches}_{\text{run}}/\text{inches}_{\text{rain}}$ )  
 $I_U$  = Percent imperviousness (unitless) characteristic of land use type U

The runoff flow rates (acre-inches per year) are then calculated using the following equation:

$$Q = P * P_J * R_{VU} * A_U$$

where:

$P$  = Precipitation rate (inches/year)  
 $P_J$  = Ratio of storms producing runoff (unitless) with a default value of 0.9  
 $R_{VU}$  = Runoff coefficient (unitless) for land use type U ( $\text{inches}_{\text{run}}/\text{inches}_{\text{rain}}$ )  
 $A_U$  = Area of land use type U (acres)

## 4.2 Subsurface Soil Concentration Protective of Groundwater

Contaminants in the soil, especially in the vadose zone, migrate mainly to the groundwater. It is necessary to calculate the DF of contaminant concentration in groundwater after mixing so that the MSC for soil that is protective of groundwater under industrial or residential land use assumptions (GWP-Ind and GWP-Res, respectively, in mg/kg) can be derived based on the DF.

$$GWP = \frac{GW}{DF}$$

where:

GW is the published risk-based or calculated MSC for groundwater for industrial or residential use (GW-Ind or GW-Res in mg/L) and which could be the MCL for the COC, if available.

The dimensional integrity of this equation is maintained by assuming the density of water is 1 kg/L.

For modeling of soil leaching to groundwater, and groundwater transport between shallow and intermediate zones, the DF can be derived by calculating the mixing concentration in groundwater ( $Conc_{mix}$ ) contributed by the contaminant source in the soil using USEPA's leaching model, Vadose Zone Leaching and Saturated Zone Mixing (VLEACHSM), a modification of VLEACH (ASTM International, 1999).

The VLEACHSM model is a one-dimensional finite difference vadose zone leaching model. The model estimates impact to groundwater due to the mobilization and migration of contaminants in the vadose zone, and subsequently estimates mixing in the saturated zone.

The model simulates the transport processes including liquid-phase advection, liquid- and vapor-phase dispersion, sorption, and decay of the contaminant. The model input parameters for the hydrogeologic and chemical properties are assumed to be uniform and homogeneous throughout the simulation.

The initial contaminant concentration distribution in the vertical polygon (soil column) from the land surface to the water table is used as input to the model. Other input parameters include duration of the source release, chemical partition coefficient, Henry's law coefficient, solubility of contaminant, free air diffusion coefficient, longitudinal dispersion coefficient, bulk density of soil, water-filled porosity, air-filled porosity, decay rate, groundwater recharge rate, Darcy velocity of groundwater, and background concentration in groundwater. Literature values will be used wherever site-specific data are not available.

The VLEACHSM simulation provides two types of results: the contaminant profile in soil varying with time and the mixing concentration in groundwater varying with time. The time-varying groundwater concentration of the source will be described as  $Conc_{source}$  in mg/L and can be calculated by the equation (Feenstra, et al, 1991):

$$Conc_{source} = \frac{Conc_{soil} * \rho_b}{(k_d \rho_b + \phi_w + H_c \phi_a)}$$



where:

Conc<sub>soil</sub> = Chemical concentration in soil (mg/kg)  
 $\rho_b$  = Bulk density of soil (kg/L)  
 $k_d$  = Partition coefficient (unitless)  
 $\phi_w$  = Water-filled porosity (unitless)  
 $\phi_a$  = Air-filled porosity (unitless)  
 $H_c$  = Henry's law coefficient (unitless)

The time-varying concentration after mixing with groundwater will be described as Conc<sub>mix</sub> in mg/L (ppm). Then DF (unitless) can be calculated as:

$$DF = \frac{Conc_{mix}}{Conc_{source}}$$

The VLEACHSM model employs single values for each input parameter and, therefore, produces single values of Conc<sub>source</sub> and Conc<sub>mix</sub> at each time interval. The input values can be the maximum, minimum, mean, or any other descriptor of the concentration data. A modeled concentration at a downgradient receptor location based on a maximum at the source site would approximate an upper bound for the contribution of the source to the receptor. Similarly, the minimum and mean source concentrations would estimate the lower bound and most probable contributions. Any of these estimates can be compared to actual measurements at the source and receptor locations as part of the model calibration process. All of these estimates will be used to describe the uncertainties in the modeling estimates and their role in the decision-making process for LHAAP.

### 4.3 Groundwater Concentration Protective of Surface Water

Contaminant plume discharge from groundwater into a nearby stream (e.g., Harrison Bayou) is confined in an area (or interface) characterized by a width and a thickness of the groundwater plume in excess of the surface water concentration that is protective of human or ecological receptors. This approach provides a calculated MSC for groundwater-to-surface water pathway (MSC-GW-SW) that is protective of surface water by the groundwater discharge pathway. The method of calculating the mixing concentration accounts for the dilution of contaminants in the stream before they are discharged into another stream or lake.

Where the contaminant concentration in the groundwater is greater than a risk-based remedial goal, an MCL or another applicable standard, a study will be performed that involves hydrodynamic surface water modeling to account for chemical dispersion and degradation, and chemical and biological partitioning, in the stream before the contaminants are discharged into Harrison Bayou or Caddo Lake. Computer models (e.g., AT123D or Domenico equation) will

be used to calculate the chemical concentration at the interface where groundwater enters the surface water body and the DF at the interface.

The AT123D is the acronym for "Analytical Transient One-, Two-, and Three-Dimensional Simulation of Waste Transport in the Aquifer System" (Yeh, 1987). The program was developed for the Oak Ridge National Laboratory and computes the spatial-temporal concentration distribution of chemicals in an aquifer system and predicts the transient spread of a contaminant plume through a groundwater aquifer. The fate and transport processes accounts for advection, dispersion, adsorption, and chemical degradation. The model can handle two kinds of source releases – instantaneous and continuous with a constant source loading, or time-varying releases; three types of waste – radioactive, chemical, and heat; four types of source configurations – a point source, a line source parallel to x-, y-, or z-axis, an area source perpendicular to the z-axis, and a volume source; and four variations of the aquifer dimensions – finite depth and finite width, finite depth and infinite width, infinite depth and finite width, and infinite depth and infinite width.

The AT123D requires input of source size (length, width, depth), source concentration, aquifer size, hydrogeologic parameters (hydraulic conductivity, porosity, hydraulic gradient), longitudinal, lateral, and vertical dispersivities, decay rate of chemicals, time steps, and points of evaluation downgradient.

The Domenico equation (Domenico and Schwartz, 1998) is an analytical model that can be used to calculate DF at a point of interest downgradient of the source. The equation, which can be depicted in three dimensions, is as follows:

$$DF = \frac{C_{si}}{C_{(x)i}} = \left\{ \exp \left[ \frac{x}{2\alpha_x} \left( 1 - \sqrt{1 + \frac{4\lambda_i \alpha_x R_i}{v}} \right) \right] \left( \operatorname{erf} \left[ \frac{S_w}{4\sqrt{\alpha_y x}} \right] \right) \left( \operatorname{erf} \left[ \frac{S_d}{2\sqrt{\alpha_z x}} \right] \right) \right\}^{-1}$$

where:

DF = dilution factor

$C_{si}$  = concentration of chemical i in source zone (mg/L)

$C_{(x)i}$  = concentration of chemical i in groundwater at distance x downgradient of source (mg/L)

$S_w$  = source width perpendicular to groundwater flow (ft)

$S_d$  = source thickness (i.e., the thickness of the affected groundwater within the permeable zone)(ft)

$D_v$  = groundwater Darcy velocity in ft/yr ( $= K \times i$ ).  $K$  is the hydraulic conductivity and  $i$  is the hydraulic gradient

$v$  = groundwater seepage velocity in ft/yr ( $= D_v/n$ ), where  $n$  is the effective porosity

$x$  = distance downgradient from source to the receiving water body (**Figure 2**)

$foc$  = fraction of organic carbon content

$\alpha_x$  = longitudinal groundwater dispersivity (ft)

$\alpha_y$  = transverse groundwater dispersivity (ft)

$\alpha_z$  = vertical groundwater dispersivity (ft)

$erf$  = error function value,  $erf\chi = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$ , which is available in tables

$\lambda_i$  = first-order degradation rate for chemical  $i$  ( $\text{day}^{-1}$ )

$$\lambda_i = \frac{\ln 2}{(t_{1/2})_i}$$

where  $(t_{1/2})_i$  is the half-life of chemical  $i$

The retardation factor for chemical  $i$  ( $R_i$ , dimensionless) is given by the equation:

$$R_i = [1 + (K_d \rho_b / n)]$$

Where

$K_d$  = distribution coefficient for the chemical between groundwater and soil ( $\text{cm}^3/\text{g}$ )

$\rho_b$  = dry soil bulk density in  $\text{g}/\text{cm}^3$ .  $K_d = K_{oc} \times foc$  where  $K_{oc}$  is the carbon-water sorption coefficient ( $\text{cm}^3/\text{g}$ )

Once the COC concentration at the interface of groundwater and surface water is calculated, it is multiplied by the DF (a value less than one, as defined below) to obtain the mixing concentration  $\text{Conc}_{\text{mix}}$  in the immediate proximity of the groundwater outflow and surface water body. The DF in the surface water body is calculated using the following equation:

$$DF = \frac{Q_{igw}}{Q_{sw} + Q_{igw}}$$

Groundwater flow rate  $Q_{igw}$  ( $\text{ft}^3/\text{sec}$ ):



$$Q_{igw} = U_{gw} * \delta_{pi} * L_m \left[ \frac{yr}{3.15 \times 10^7 \text{ sec}} \right]$$

where:

- $U_{gw}$  = The approaching groundwater velocity (ft/yr)  
 $\delta_{pi}$  = The thickness of the plume approaching the surface water body (ft)  
 $L_m$  = The width of the plume approaching surface water body (ft)

Surface water flow rate  $Q_{sw}$ :

$$Q_{sw} = 7Q2 \quad (\text{when } 7Q2 < 100 \text{ ft}^3/\text{sec})$$

$$Q_{sw} = V_{sw} * W_{sw} * h_{sw} \quad (\text{when } 7Q2 > 100 \text{ ft}^3/\text{sec in large river or lake})$$

where:

- $V_{sw}$  = Lateral velocity of mixing in the surface water body (ft/sec)  
 $W_{sw}$  = Longitudinal extent of mixing in the surface water body (ft)  
 $h_{sw}$  = Width of mixing in the surface water body (ft)  
 $7Q2$  = Stream flow over 7 consecutive days with recurrence period of 2 years

The mixing concentration  $Conc_{mix}$  is then used to calculate the overall dilution factor  $DF_{overall}$  from the source:

$$DF_{overall} = \frac{Conc_{mix}}{Conc_{source}}$$

$DF_{overall}$  is then used to calculate groundwater concentration protective of surface water MSC-GW-SW according to the equation:

$$MSC - GW - SW = \frac{MSC - SW}{DF_{overall}}$$

where

- MSC-GW-SW = MSC for groundwater at the source area that is protective of human or ecological receptors in surface water at a downgradient location (mg/L)  
 MSC-SW = MSC of surface water protective of human or environmental receptors, as appropriate, at the downgradient location, (mg/L).

## 5.0 Summary

The proposed modeling would be conducted at a total of 14 locations, which includes Sites 04, 12, 16, 17, 18/24, 29, 32, 35A, 35B, 35C, 47, 48, 50, and 67. Because several of these sites could affect the same creeks or bayous, they were grouped together for modeling purposes. For example, COCs from Sites 17 and 18/24 will be modeled together, as will COCs from Sites 29 and 32, Sites 04, 32, and 35A, and Sites 35B, 47, and 50 (**Figure 1, Table 3**). The COCs in soil to be modeled include perchlorate, six nitrated toluene derivatives (2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and 2,4,6-trinitrotoluene), and two phthalate esters (bis[2-ethylhexyl]phthalate and di-n-butylphthalate).

The phthalate esters do not represent unacceptable risks to human health at any of the LHAAP sites but were detected in the soil at Site 35A, in groundwater at Sites 12 and 47, and in surface water in Goose Prairie Creek. Although these compounds do not contribute appreciably to human health risk at LHAAP sites, cancer risks above acceptable limits were estimated for potential consumption of fish from Goose Prairie Creek and Caddo Lake (**Table 1**).

Groundwater COCs to be modeled include perchlorate, six nitrated toluene derivatives (2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and 2,4,6-trinitrotoluene), nine VOCs (tetrachloroethene, trichloroethene, 1,1,2-trichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, 1,2-dichloroethane, vinyl chloride, methylene chloride, and chloroform), and the two phthalate esters. Note that trichloroethene, cis-1,2-dichloroethene, and vinyl chloride are tetrachloroethene degradation products, and that cis-1,2-dichloroethene and vinyl chloride are trichloroethene degradation products (Voegel et al, 1987) that can form in the future. Degradation products will be modeled at locations where either tetrachloroethene or trichloroethene represent unacceptable human health risk, even if they are not detected at the site.

1,1,2-trichloroethane was measured in groundwater at Sites 47, 50, and 67, and was designated as a Target COC because of its measured concentrations above MCL values (Jacobs, 2002d). Two 1,1,2-trichloroethane degradation products, 1,2-dichloroethane and vinyl chloride, are Target COCs for groundwater modeling (**Table 1**). Therefore, 1,1,2-trichloroethane will be modeled at these sites.

Because metals, dioxins, pesticides (including 4,4'-DDT), PCBs (including Aroclor 1254), and PAHs (including fluoranthene) (**Table 2**) are the subjects of a background study (Shaw, 2004), no transport modeling of these chemicals from LHAAP sites to downstream locations will be performed until the final results of the background study are available.

It is anticipated that with the mixing/dilution in the streams, the required groundwater concentration protective of surface water (MSC-GW-SW) can be satisfied for all LHAAP sites.

Modeling locations (**Figure 1, Table 3**) were chosen to evaluate transport from selected sites or groups of sites to surface or ground water receptors. For example, Sites 04, 32 and 35A are located near a tributary to Goose Prairie Creek (**Figure 1**). Data from wells near these three sites will be examined to determine whether water designated as shallow and intermediate zones are connected or, in fact, represent one shallow groundwater zone that could affect Goose Prairie Creek. Accordingly, **Table 3** shows Sites 04 and 35A as a modeling location where the modeled medium is shallow groundwater. The modeling type is a model of shallow to intermediate groundwater. The modeling path is shown as being from Sites 04, 35A to Sites 04, 35A to indicate that groundwater beneath these sites will be modeled. It is expected that this model will include groundwater data from Sites 29, 32 or 35B or other nearby sites. The concentrations of tetrachloroethylene (**Table 3**) and trichloroethylene (**Table 3**), 1,1-dichloroethylene, perchlorate, and phthalate esters will be included in the model, as will degradation products of tetrachloroethylene and trichloroethylene (cis-1, 2-dichloroethene and vinyl chloride).

At Modeling Location 1 (**Table 3, Figure 1**), perchlorate, 2,4,6-trinitrotoluene, and phthalate ester transport by soil erosion will be modeled from Sites 04, 32, and 35A to Goose Prairie Creek. Leaching of these chemicals from soil to groundwater will be modeled at Modeling Location 1 also, as will groundwater transport of tetrachloroethylene and trichloroethylene, 1,1-dichloroethylene, perchlorate, and phthalate esters from groundwater to surface water and sediment in Goose Prairie Creek.

Modeling Locations 1 through 14 are shown in **Figure 1** as approximate locations where the site could affect the nearest receptor water body. Actual locations will be selected using topological maps and other site-specific information, and will be described in detail in the final report of modeling results. Other modeling locations, media, pathways, and chemicals are summarized in **Table 3** and **Figure 1**. The final modeling report will address these models as being complimentary among nearby sites that are shown to have similar sources or media. The models, media, chemicals, and pathways shown in this memorandum are based on available information. It is expected that some locations might be added or moved as additional information becomes available.

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***Tables***



**Table 1**  
**Chemicals of Concern for Human Health Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site  | Chemical                   | Environmental Medium                              |             |               |          |      | Reference                                                                 | Footnote Comment                                 |
|-------|----------------------------|---------------------------------------------------|-------------|---------------|----------|------|---------------------------------------------------------------------------|--------------------------------------------------|
|       |                            | Soil                                              | Groundwater | Surface Water | Sediment | Fish |                                                                           |                                                  |
| 04    | 2,3,7,8-TCDD(dioxins)      | O                                                 | O           |               |          |      | Table 3-73 <sup>a</sup>                                                   |                                                  |
|       | Perchlorate                | No human health risk estimate made for any medium |             |               |          |      | Table 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> , <sup>c</sup>  | 2 <sup>c</sup> , 3 <sup>c</sup> , 4 <sup>c</sup> |
| 08    | 2,3,7,8-TCDD(dioxins)      |                                                   | O           |               |          |      | Table 3-73 <sup>a</sup>                                                   |                                                  |
| 12    | Trichloroethene            |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 2,3,7,8-TCDD (dioxins)     |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Vinyl Chloride             |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Bis(2-ethylhexyl)phthalate |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Perchlorate                |                                                   | O           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup> , <sup>c</sup>           | 5 <sup>c</sup>                                   |
| 16    | Trichloroethene            |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup>                                                    |                                                  |
|       | 2,3,7,8-TCDD (dioxins)     | O                                                 | O           |               |          |      | Tables 7, 8 <sup>f</sup>                                                  |                                                  |
|       | cis-1,2-Dichloroethene     |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup>                                                    |                                                  |
|       | 1,2-Dichloroethane         |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup>                                                    |                                                  |
|       | 1,1-Dichloroethene         |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup>                                                    |                                                  |
|       | Vinyl Chloride             |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup>                                                    |                                                  |
|       | Perchlorate                |                                                   | X           |               |          |      | Table 3-7 <sup>e</sup> , <sup>c</sup>                                     | 3 <sup>c</sup>                                   |
| 17    | 2,4,6-Trinitrotoluene      | X                                                 |             |               |          |      | Table 3-92 <sup>d</sup> , Table 3-6 <sup>e</sup>                          |                                                  |
|       | 2,3,7,8-TCDD (dioxins)     | O                                                 |             |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | 2,4-Dinitrotoluene         | X                                                 |             |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-6 <sup>e</sup>                |                                                  |
|       | 2,6-Dinitrotoluene         | X                                                 |             |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Trichloroethene            |                                                   | X           |               |          |      | Table 3-90 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 1,1-Dichloroethene         |                                                   | X           |               |          |      | Table 3-90 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 1,2-Dichloroethane         |                                                   | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup> , <sup>c</sup> |                                                  |
|       | Perchlorate                |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          | 1 <sup>c</sup> , 3 <sup>c</sup>                  |
| 18/24 | Methylene chloride         |                                                   | X           |               |          |      | Table 3-90 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | Trichloroethene            |                                                   | X           |               |          |      | Table 3-90 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | Chloroform                 |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 2,3,7,8-TCDD (dioxins)     |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Bromodichloromethane       |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | 4-4'-DDD                   |                                                   | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Perchlorate                |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          | 2 <sup>c</sup> , 3 <sup>c</sup>                  |
|       | Antimony                   |                                                   | O           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
|       | Nickel                     |                                                   | O           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
|       | Manganese                  |                                                   | O           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
| 29    | 2,4,6-Trinitrotoluene      | O                                                 |             |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Methylene chloride         |                                                   | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                |                                                  |
|       | 1,2-Dichloroethane         |                                                   | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup>                                         |                                                  |
|       | 2,4-Dinitrotoluene         | O                                                 | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                |                                                  |
|       | 2,6-Dinitrotoluene         |                                                   | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                |                                                  |
|       | 2-Nitrotoluene             |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 3-Nitrotoluene             |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | 4-Nitrotoluene             |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | Chloroform                 |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          |                                                  |
|       | Trichloroethene            |                                                   | X           |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                |                                                  |
|       | Perchlorate                |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup> , Table 3-7 <sup>e</sup>                          | 3 <sup>c</sup>                                   |
|       | Aluminum                   |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
|       | Antimony                   |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
|       | Arsenic                    |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
|       | Nickel                     |                                                   | X           |               |          |      | Table 3-92 <sup>d</sup>                                                   |                                                  |
| 32    | 2,4,6-Trinitrotoluene      | X                                                 |             |               |          |      | Tables 3-90 and 3-92 <sup>d</sup> , Table 3-6 <sup>e</sup>                |                                                  |
|       | 2,4-Dinitrotoluene         | O                                                 |             |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | 2,3,7,8-TCDD (dioxins)     | O                                                 | O           |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |
|       | Arsenic                    | O                                                 |             |               |          |      | Table 3-90 <sup>d</sup>                                                   |                                                  |

**Table 1**  
**Chemicals of Concern for Human Health Risk**  
**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site | Chemical                     | Environmental Medium |             |               |          |      | Reference                                                  | Footnote Comment                |
|------|------------------------------|----------------------|-------------|---------------|----------|------|------------------------------------------------------------|---------------------------------|
|      |                              | Soil                 | Groundwater | Surface Water | Sediment | Fish |                                                            |                                 |
| 35A  | 2,3,7,8-TCDD(dioxins)        | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Bis(2-ethylhexyl)phthalate   | O                    | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(a)pyrene (PAH)         | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(b)fluoranthene (PAH)   | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Dibenzo(a,h)anthracene (PAH) | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Indeno(1,2,3-cd)pyrene (PAH) | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 1,1-Dichloroethene           |                      | X           |               |          |      | Tables 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> |                                 |
|      | Tetrachloroethene            |                      | X           |               |          |      | Tables 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> |                                 |
|      | Vinyl chloride               |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | RDX                          |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Trichloroethene              |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Perchlorate                  |                      | X           |               |          |      | Table 3-6 <sup>b</sup>                                     | 1 <sup>c</sup>                  |
| 35B  | Aldrin                       | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(a)pyrene (PAH)         | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 1,1-Dichloroethene           |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Trichloroethene              |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Tetrachloroethene            |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | 2,3,7,8-TCDD (dioxins)       |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Thallium                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Antimony                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
| 35C  | 2,3,7,8-TCDD (dioxins)       | O                    | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 1,2-Dichloroethane           |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 2,6-Dinitrotoluene           |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Trichloroethene              |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Thallium                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Silver                       |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Nickel                       |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Aluminum                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
| 46   | Benzo(a)pyrene (PAH)         | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(b)fluoranthene (PAH)   | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Dibenzo(a,h)anthracene (PAH) | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(a)anthracene (PAH)     | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Thallium                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    | Value is suspect <sup>b</sup>   |
|      | Antimony                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Manganese                    |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Perchlorate                  |                      |             |               |          |      | c                                                          | 1 <sup>c</sup>                  |
| 47   | Benzo(a)pyrene (PAH)         | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(b)fluoranthene (PAH)   | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Benzo(a)anthracene (PAH)     | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Trichloroethene              |                      | X           |               |          |      | Tables 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> |                                 |
|      | 1,1-Dichloroethene           |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Chloroform                   |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Tetrachloroethene            |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Vinyl chloride               |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | 2,3,7,8-TCDD (dioxins)       |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Pentachlorophenol            |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 1,2-Dichloroethane           |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 2,4-Dinitrotoluene           |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 2,6-Dinitrotoluene           |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | 1,1,2-Trichloroethane        |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Bis(2-ethylhexyl)phthalate   |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | cis-1,2-Dichloroethene       |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                 |
|      | Acetone                      |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Perchlorate                  |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> , c       | 1 <sup>c</sup> , 2 <sup>c</sup> |
|      | Antimony                     |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |
|      | Arsenic                      | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                 |
|      | Cadmium                      |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                 |

**Table 1**  
**Chemicals of Concern for Human Health Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site                | Chemical                                          | Environmental Medium |             |               |          |      | Reference                                                  | Footnote Comment                                                  |
|---------------------|---------------------------------------------------|----------------------|-------------|---------------|----------|------|------------------------------------------------------------|-------------------------------------------------------------------|
|                     |                                                   | Soil                 | Groundwater | Surface Water | Sediment | Fish |                                                            |                                                                   |
|                     | Manganese                                         |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Nickel                                            |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Silver                                            |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Thallium                                          |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Tin                                               |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
| 48                  | Benzo(a)pyrene (PAH)                              | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Benzo(b)fluoranthene (PAH)                        | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Dibenzo(a,h)anthracene (PAH)                      | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | 2,3,7,8-TCDD (dioxins)                            | O                    | X           |               |          |      | Table 3-73 <sup>a</sup>                                    | Value is suspect <sup>h</sup>                                     |
|                     | Vinyl chloride                                    | O                    |             |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Tetrachloroethene                                 |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Trichloroethene                                   |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Perchlorate                                       |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Thallium                                          |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    | Value is suspect <sup>h</sup>                                     |
|                     | Silver                                            |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Nickel                                            |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Aluminum                                          |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Antimony                                          |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
| 49                  | 2,3,7,8-TCDD (dioxins)                            | O                    | O           |               |          |      | Table 3-90 <sup>d</sup>                                    |                                                                   |
| 50                  | Trichloroethene                                   |                      | X           |               |          |      | Tables 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> |                                                                   |
|                     | Chloroform                                        |                      | X           |               |          |      | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Vinyl chloride                                    |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                                                   |
|                     | 1,1-Dichloroethene                                |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                                                   |
|                     | cis-1,2-Dichloroethene                            |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                                                   |
|                     | 1,2-Dichloroethane                                |                      | X           |               |          |      | Tables 3-73 and 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup> |                                                                   |
|                     | 2,3,7,8-TCDD (dioxins)                            |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Tetrachloroethene                                 |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                                                   |
|                     | 1,1,2-Trichloroethane                             |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Perchlorate                                       |                      | X           |               |          |      | Table 3-74 <sup>a</sup> , Table 3-6 <sup>b</sup>           | 1 <sup>c</sup> , 2 <sup>c</sup> , 3 <sup>c</sup> , 4 <sup>c</sup> |
| 60                  | No human health risk estimate made for any medium |                      |             |               |          |      |                                                            |                                                                   |
| 67                  | 1,1-Dichloroethene                                |                      | X           |               |          |      | Table 3-73 <sup>a</sup>                                    | 5 <sup>d</sup>                                                    |
|                     | 1,2-Dichloroethane                                |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | 1,1,2-Trichloroethane                             |                      | X           |               |          |      | Table 3-73 <sup>a</sup> , Table 3-6 <sup>b</sup>           |                                                                   |
|                     | Trichloroethene                                   |                      | O           |               |          |      | Table 3-73 <sup>a</sup>                                    |                                                                   |
| Central Creek       | 2,3,7,8-TCDD (dioxins)                            |                      |             | O             |          | O    | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Arsenic                                           |                      |             |               |          | X    | Tables 3-73 and 3-74 <sup>a</sup>                          |                                                                   |
|                     | Cadmium                                           |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | Manganese                                         |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                    |                                                                   |
| Saunders Branch     | Arsenic                                           |                      |             |               |          | X    | Tables 3-73 and 3-74 <sup>a</sup>                          |                                                                   |
| Goose Prairie Creek | 3is(2-ethylhexyl)phthalate                        |                      |             | O             |          | X    | Tables 3-73 and 3-74 <sup>a</sup>                          |                                                                   |
|                     | Di-n-butylphthalate                               |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                    |                                                                   |
|                     | 2,3,7,8-TCDD (dioxins)                            |                      |             | O             |          | O    | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Vinyl Chloride                                    |                      |             |               |          | O    | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | 2,6-Dinitrotoluene                                |                      |             |               |          | O    | Table 3-73 <sup>a</sup>                                    |                                                                   |
|                     | Arsenic                                           |                      |             |               |          | X    | Tables 3-73 and 3-74 <sup>a</sup>                          |                                                                   |
|                     | Aluminum                                          |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                    |                                                                   |
| Hamison Bayou       | 2,3,7,8-TCDD (dioxins)                            |                      |             | O             |          | X    | Table 3-90 <sup>d</sup>                                    | 6 <sup>h</sup>                                                    |
|                     | Trichloroethene                                   |                      |             | O             |          | O    | Table 3-90 <sup>d</sup>                                    |                                                                   |
|                     | 1,1-Dichloroethene                                |                      |             | O             |          |      | Table 3-90 <sup>d</sup>                                    |                                                                   |
|                     | Vinyl chloride                                    |                      |             |               |          | O    | Table 3-90 <sup>d</sup>                                    |                                                                   |
|                     | Arsenic                                           |                      |             |               |          | X    | Tables 3-90 and 3-92 <sup>d</sup>                          |                                                                   |
|                     | Barium                                            |                      |             |               |          | X    | Table 3-92 <sup>d</sup>                                    |                                                                   |
|                     | Thallium                                          |                      |             |               |          | X    | Table 3-92 <sup>d</sup>                                    |                                                                   |



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**Table 1**  
**Chemicals of Concern for Human Health Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site       | Chemical                     | Environmental Medium |             |               |          |      | Reference                                                             | Footnote Comment |
|------------|------------------------------|----------------------|-------------|---------------|----------|------|-----------------------------------------------------------------------|------------------|
|            |                              | Soil                 | Groundwater | Surface Water | Sediment | Fish |                                                                       |                  |
| Caddo Lake | Benzo(a)pyrene (PAH)         |                      |             |               | O        | X    | Table 3-73 <sup>a</sup>                                               |                  |
|            | Dibenzo(a,h)anthracene (PAH) |                      |             |               | O        | X    | Table 3-73 <sup>a</sup>                                               |                  |
|            | Benzo(b)fluoranthene (PAH)   |                      |             |               | O        | X    | Table 3-73 <sup>a</sup>                                               |                  |
|            | Benzo(k)fluoranthene (PAH)   |                      |             |               |          | O    | Table 3-73 <sup>a</sup>                                               |                  |
|            | Benzo(a)anthracene (PAH)     |                      |             |               | O        | X    | Table 3-73 <sup>a</sup>                                               |                  |
|            | 2,3,7,8-TCDD (dioxins)       |                      |             |               | O        | X    | Tables 3-73 <sup>a</sup> , Table 3-90 <sup>d</sup>                    |                  |
|            | Chrysene                     |                      |             |               |          | O    | Table 3-73 <sup>a</sup>                                               |                  |
|            | Bis(2-ethylhexyl)phthalate   |                      |             |               |          | X    | Table 3-92 <sup>d</sup>                                               |                  |
|            | Di-n-butylphthalate          |                      |             |               |          | X    | Table 3-92 <sup>d</sup>                                               |                  |
|            | Arsenic                      |                      |             |               | O        | X    | Tables 3-73 and 3-74 <sup>a</sup> , Tables 3-90 and 3-92 <sup>d</sup> |                  |
|            | Aluminum                     |                      |             |               |          | X    | Table 3-74 <sup>a</sup> , Table 3-92 <sup>d</sup>                     |                  |
|            | Barium                       |                      |             |               |          | X    | Table 3-74 <sup>a</sup> , Table 3-92 <sup>d</sup>                     |                  |
|            | Cadmium                      |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |
|            | Manganese                    |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |
|            | Mercury                      |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |
|            | Silver                       |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |
|            | Thallium                     |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |
|            | Vanadium                     |                      |             |               |          | X    | Table 3-74 <sup>a</sup>                                               |                  |

**Notes and Abbreviations**

This table shows the LHAAP sites and human health chemicals of concern (COCs) associated with exposures to concentrations in soil, groundwater, surface water, sediment, or fish. The COCs are marked by an "X" or an "O" depending on whether or not they exceed acceptable human health risk criteria. References to risk assessments or feasibility study reports that justify the "X" or "O" entry are shown in the reference column, often with the source table cited. For some chemicals, generally perchlorate, an entire document is cited as a reference. More specific comments related to chemicals at certain sites are given in the last column.

**Comments:**

1. Perchlorate in groundwater above 4 micrograms/L. Possible migration to intermediate zone.
2. Possible perchlorate leaching from soil to groundwater.
3. Possible perchlorate discharge from groundwater to surface water.
4. Possible perchlorate discharge from surface soil to surface water and sediment.
5. Perchlorate in one shallow well. Possible, but no apparent migration.
6. Harrison Bayou is assumed not to be a drinking water supply.

<sup>a</sup> Jacobs Engineering Group, Inc., 2003, *Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 4 Sites, Longhorn Army Ammunition Plant, Karnack, Texas*, June.

<sup>b</sup> Jacobs Engineering Group, Inc., 2002d, *Draft Feasibility Study for the Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60, 67, Goose Prairie Creek, Saunder's Branch, Central Creek, and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, August.

<sup>c</sup> Solutions To Environmental Problems, Inc., 2003, *Plant-Wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas*, Vol. 1, March.

<sup>d</sup> Jacobs Engineering Group, Inc., 2002a, *Draft Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites, Vol. 1, Sites 12, 16, 17, 18/24, 29, 32, and 49, Longhorn Army Ammunition Plant, Karnack, Texas*, April.

<sup>e</sup> Jacobs Engineering Group, Inc., 2002c, *Draft Final Feasibility Study for the Group 2 Sites, Sites 12, 16, 17, 18/24, 29, 32, and 49, Longhorn Army Ammunition Plant, Karnack, Texas*, May.

<sup>f</sup> Jacobs Engineering Group, Inc., 2001b, *Draft Final Addendum to Final Baseline Risk Assessment: Human Health Evaluation, A Supplement to the Remedial Investigation Report, Site 16 Landfill, Longhorn Army Ammunition Plant, Karnack, Texas*, October.

<sup>g</sup> Jacobs Engineering Group, Inc., 2001c, *Final Ecological Risk Assessment, A Supplement to the Remedial Investigation Report, Site 16 Landfill, Longhorn Army Ammunition Plant, Karnack, Texas*, October.

<sup>h</sup> LHAAP Meeting Minutes, June 2002, January 2003, April 2003.

O Chemical represents a human health COC with cancer risk within acceptable 1E-06 to 1E-04 range or noncancer Hazard Index below 1.

X Chemical represents a human health COC with cancer risk above the acceptable 1E-06 to 1E-04 range or noncancer Hazard Index above 1 or has remediation level specified in the Feasibility Study report for the site.

**Table 2**  
**Chemicals of Concern for Ecological Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site  | Chemical  | Environmental Medium |             |               |          | Reference                              |
|-------|-----------|----------------------|-------------|---------------|----------|----------------------------------------|
|       |           | Soil                 | Groundwater | Surface Water | Sediment |                                        |
| 04    | Aluminum  | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Arsenic   | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Chromium  | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Cobalt    | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Lead      | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Manganese | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Vanadium  | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
|       | Zinc      | X                    |             |               |          | Table 4-2 <sup>a</sup>                 |
| 08    | Aluminum  | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Chromium  | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Manganese | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Mercury   | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Silver    | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Vanadium  | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
|       | Zinc      | X                    |             |               |          | Table 4-3 <sup>a</sup>                 |
| 12    | Aluminum  |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Arsenic   | X                    |             |               | X        | Tables 4-1 and 4-13 <sup>b</sup>       |
|       | Barium    |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Cadmium   |                      |             | X             | X        | Tables 4-7 and 4-13 <sup>b</sup>       |
|       | Chromium  | X                    |             |               |          | Table 4-1 <sup>b</sup>                 |
|       | Copper    |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Iron      |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Lead      |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Manganese |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
|       | Zinc      |                      |             | X             |          | Table 4-7 <sup>b</sup>                 |
| 16    | Aluminum  | X                    |             | X             |          | Table 5-8 <sup>c</sup>                 |
|       | Arsenic   |                      |             | X             | X        | Table 5-8 <sup>c</sup>                 |
|       | Barium    |                      |             | X             | X        | Table 5-8 <sup>c</sup>                 |
|       | Chromium  |                      |             | X             |          | Table 5-8 <sup>c</sup>                 |
|       | Mercury   | X                    |             | X             |          | Table 5-8 <sup>c</sup>                 |
|       | Selenium  | X                    |             | X             |          | Table 5-8 <sup>c</sup>                 |
|       | Thallium  | X                    |             | X             | X        | Table 5-8 <sup>c</sup>                 |
|       | Zinc      | X                    |             | X             |          | Table 5-8 <sup>e</sup>                 |
|       |           |                      |             |               |          | Table 5-8 <sup>e</sup>                 |
| 17    | Aluminum  | X                    |             | X             |          | Tables 4-2 and 4-8 <sup>b</sup>        |
|       | Antimony  |                      |             |               | X        | Table 4-14 <sup>b</sup>                |
|       | Arsenic   |                      |             |               | X        | Table 4-14 <sup>b</sup>                |
|       | Barium    | X                    |             | X             |          | Tables 4-2 and 4-8 <sup>b</sup>        |
|       | Cadmium   | X                    |             |               | X        | Tables 4-2 and 4-14 <sup>b</sup>       |
|       | Chromium  | X                    |             | X             |          | Tables 4-2 and 4-8 <sup>b</sup>        |
|       | Copper    | X                    |             | X             | X        | Tables 4-2, 4-8, and 4-14 <sup>b</sup> |
|       | Iron      |                      |             | X             |          | Table 4-8 <sup>b</sup>                 |
|       | Lead      | X                    |             | X             | X        | Tables 4-2, 4-8, and 4-14 <sup>b</sup> |
|       | Manganese | X                    |             | X             |          | Tables 4-2 and 4-8 <sup>b</sup>        |
|       | Mercury   | X                    |             | X             | X        | Tables 4-2, 4-8, and 4-14 <sup>b</sup> |
|       | Nickel    | X                    |             | X             |          | Tables 4-2 and 4-8 <sup>b</sup>        |
|       | Selenium  | X                    |             |               |          | Table 4-2 <sup>b</sup>                 |
|       | Thallium  | X                    |             |               |          | Table 4-2 <sup>b</sup>                 |
|       | Vanadium  | X                    |             |               |          | Table 4-2 <sup>b</sup>                 |
| 18/24 | Zinc      | X                    |             | X             | X        | Tables 4-2, 4-8, and 4-14 <sup>b</sup> |
|       | Aluminum  |                      |             | X             |          | Table 4-9 <sup>b</sup>                 |
|       | Arsenic   |                      |             |               | X        | Table 4-15 <sup>b</sup>                |
|       | Barium    | X                    |             | X             |          | Tables 4-3 and 4-9 <sup>b</sup>        |
|       | Chromium  | X                    |             | X             | X        | Tables 4-3, 4-9, and 4-15 <sup>b</sup> |
|       | Copper    |                      |             | X             |          | Table 4-9 <sup>b</sup>                 |
|       | Iron      |                      |             | X             | X        | Tables 4-9 and 4-15 <sup>b</sup>       |
|       | Lead      | X                    |             | X             | X        | Tables 4-3, 4-9, and 4-15 <sup>b</sup> |
|       | Manganese |                      |             | X             | X        | Tables 4-9 and 4-15 <sup>b</sup>       |
|       | Mercury   | X                    |             |               |          | Table 4-3 <sup>b</sup>                 |
|       | Nickel    |                      |             | X             |          | Table 4-9 <sup>b</sup>                 |
|       | Selenium  |                      |             | X             |          | Table 4-9 <sup>b</sup>                 |
|       | Vanadium  |                      |             | X             |          | Table 4-9 <sup>b</sup>                 |
|       | Zinc      | X                    |             | X             |          | Tables 4-3 and 4-9 <sup>b</sup>        |

**Table 2**  
**Chemicals of Concern for Ecological Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site | Chemical              | Environmental Medium |             |               |          | Reference                               |
|------|-----------------------|----------------------|-------------|---------------|----------|-----------------------------------------|
|      |                       | Soil                 | Groundwater | Surface Water | Sediment |                                         |
| 29   | Aluminum              | X                    | H           | X             |          | Tables 4-4 and 4-10 <sup>b</sup>        |
|      | Arsenic               | X                    | H           |               | X        | Tables 4-4 and 4-16 <sup>b</sup>        |
|      | Barium                | X                    |             | X             |          | Tables 4-4 and 4-10 <sup>b</sup>        |
|      | Cadmium               |                      |             | X             | X        | Tables 4-10 and 4-16 <sup>b</sup>       |
|      | Chromium              | X                    |             | X             | X        | Tables 4-4, 4-10, and 4-16 <sup>b</sup> |
|      | Copper                |                      |             | X             |          | Table 4-10 <sup>b</sup>                 |
|      | Iron                  |                      |             | X             | X        | Tables 4-10 and 4-16 <sup>b</sup>       |
|      | Lead                  | X                    |             | X             | X        | Tables 4-4, 4-10, and 4-16 <sup>b</sup> |
|      | Manganese             | X                    |             | X             |          | Tables 4-4 and 4-10 <sup>b</sup>        |
|      | Mercury               | X                    |             |               | X        | Tables 4-4 and 4-16 <sup>b</sup>        |
|      | Nickel                | X                    | H           |               | X        | Tables 4-4 and 4-16 <sup>b</sup>        |
|      | Selenium              | X                    |             |               |          | Table 4-4 <sup>b</sup>                  |
|      | Silver                |                      |             |               | X        | Table 4-16 <sup>b</sup>                 |
|      | Thallium              | X                    |             |               |          | Table 4-4 <sup>b</sup>                  |
|      | Vanadium              | X                    |             | X             |          | Tables 4-4 and 4-10 <sup>b</sup>        |
|      | Zinc                  | X                    |             | X             |          | Tables 4-4 and 4-10 <sup>b</sup>        |
|      | Fluoranthene          |                      |             |               | X        | Table 4-16 <sup>b</sup>                 |
|      | 2,4,6-Trinitrotoluene | H                    |             | X             |          | Table 4-10 <sup>b</sup>                 |
| 32   | Aluminum              | X                    |             | X             |          | Tables 4-5 and 4-11 <sup>b</sup>        |
|      | Antimony              |                      |             |               | X        | Table 4-17 <sup>b</sup>                 |
|      | Arsenic               | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Barium                |                      |             | X             |          | Table 4-11 <sup>b</sup>                 |
|      | Chromium              | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Cobalt                | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Copper                | X                    |             | X             |          | Tables 4-5 and 4-11 <sup>b</sup>        |
|      | Iron                  |                      |             | X             |          | Table 4-11 <sup>b</sup>                 |
|      | Lead                  | X                    |             | X             | X        | Tables 4-5, 4-11, and 4-17 <sup>b</sup> |
|      | Manganese             | X                    |             | X             |          | Tables 4-5 and 4-11 <sup>b</sup>        |
|      | Mercury               | X                    |             |               | X        | Tables 4-5 and 4-17 <sup>b</sup>        |
|      | Nickel                | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Selenium              | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Thallium              | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
|      | Vanadium              | X                    |             |               |          | Table 4-5 <sup>b</sup>                  |
| 35A  | Zinc                  | X                    |             | X             |          | Tables 4-5 and 4-11 <sup>b</sup>        |
|      | Aluminum              | X                    |             | X             |          | Tables 4-4 and 4-13 <sup>a</sup>        |
|      | Antimony              | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
|      | Arsenic               | X                    |             |               | X        | Tables 4-4 and 4-19 <sup>a</sup>        |
|      | Chromium              | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
|      | Copper                | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
|      | Iron                  |                      |             | X             |          | Table 4-13 <sup>a</sup>                 |
|      | Lead                  | X                    |             | X             |          | Tables 4-4 and 4-13 <sup>a</sup>        |
|      | Manganese             | X                    | H           | X             |          | Tables 4-4 and 4-13 <sup>a</sup>        |
|      | Mercury               | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
| 35B  | Selenium              | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
|      | Tin                   |                      |             | X             |          | Table 4-13 <sup>a</sup>                 |
|      | Vanadium              | X                    |             |               |          | Table 4-4 <sup>a</sup>                  |
|      | Zinc                  | X                    |             | X             |          | Tables 4-4 and 4-13 <sup>a</sup>        |
|      | Aroclor 1254 (PCBs)   |                      |             |               | X        | Table 4-19 <sup>a</sup>                 |
|      | Aluminum              | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Cadmium               | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Chromium              | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Cobalt                | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Manganese             | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
| 35C  | Mercury               | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Selenium              | X                    |             |               |          | Table 4-5 <sup>a</sup>                  |
|      | Silver                | X                    | H           |               |          | Table 4-6 <sup>a</sup>                  |
|      | Vanadium              | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |
|      | Zinc                  | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |
|      | Aluminum              | X                    | H           |               |          | Table 4-6 <sup>a</sup>                  |
|      | Arsenic               | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |
|      | Chromium              | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |
|      | Cobalt                | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |
|      | Manganese             | X                    |             |               |          | Table 4-6 <sup>a</sup>                  |



**Table 2**  
**Chemicals of Concern for Ecological Risk**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Site | Chemical            | Environmental Medium |             |               |          | Reference                                |
|------|---------------------|----------------------|-------------|---------------|----------|------------------------------------------|
|      |                     | Soil                 | Groundwater | Surface Water | Sediment |                                          |
| 46   | Aluminum            | X                    |             | X             |          | Tables 4-7 and 4-14 <sup>a</sup>         |
|      | Antimony            | X                    | H           |               |          | Table 4-7 <sup>a</sup>                   |
|      | Arsenic             | X                    |             |               | X        | Tables 4-7 and 4-20 <sup>a</sup>         |
|      | Barium              | X                    |             | X             |          | Tables 4-7 and 4-14 <sup>a</sup>         |
|      | Beryllium           |                      |             | X             |          | Tables 4-14 and 4-20a                    |
|      | Cadmium             | X                    |             | X             |          | Tables 4-7 and 4-14 <sup>a</sup>         |
|      | Chromium            | X                    |             | X             | X        | Tables 4-7, 4-14, and 4-20 <sup>a</sup>  |
|      | Cobalt              | X                    |             |               |          | Table 4-7 <sup>a</sup>                   |
|      | Copper              | X                    |             | X             | X        | Tables 4-7, 4-14, and 4-20 <sup>a</sup>  |
|      | Iron                |                      |             | X             | X        | Tables 4-14 and 4-20a                    |
|      | Lead                | X                    |             | X             | X        | Tables 4-7, 4-14, and 4-20 <sup>a</sup>  |
|      | Manganese           | X                    | H           | X             | X        | Tables 4-7, 4-14, and 4-20 <sup>a</sup>  |
|      | Mercury             | X                    |             |               |          | Table 4-7 <sup>a</sup>                   |
|      | Nickel              |                      |             | X             |          | Table 4-14 <sup>a</sup>                  |
|      | Selenium            | X                    |             |               |          | Table 4-7 <sup>a</sup>                   |
|      | Vanadium            | X                    |             | X             |          | Tables 4-7 and 4-14 <sup>a</sup>         |
|      | Zinc                | X                    |             | X             | X        | Tables 4-7, 4-14, and 4-20 <sup>a</sup>  |
|      | 4,4'-DDT            |                      |             |               | X        | Table 4-20 <sup>a</sup>                  |
|      | Aroclor 1254 (PCBs) |                      |             |               | X        | Table 4-20 <sup>a</sup>                  |
| 47   | Aluminum            | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Antimony            | X                    | H           |               |          | Table 4-8 <sup>a</sup>                   |
|      | Arsenic             | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Barium              | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Cadmium             | X                    | H           |               |          | Table 4-8 <sup>a</sup>                   |
|      | Chromium            | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Cobalt              | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Copper              | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Lead                | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Manganese           | X                    | H           |               |          | Table 4-8 <sup>a</sup>                   |
|      | Mercury             | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Selenium            | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Silver              | X                    | H           |               |          | Table 4-8 <sup>a</sup>                   |
|      | Vanadium            | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
|      | Zinc                | X                    |             |               |          | Table 4-8 <sup>a</sup>                   |
| 48   | Aluminum            | X                    | H           |               |          | Table 4-9 <sup>a</sup>                   |
|      | Antimony            | X                    | H           |               |          | Table 4-9 <sup>a</sup>                   |
|      | Arsenic             | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Barium              | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Cadmium             | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Chromium            | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Cobalt              | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Copper              | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Lead                | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Manganese           | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Mercury             | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Selenium            | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
|      | Vanadium            | X                    |             |               |          | Table 4-9 <sup>a</sup>                   |
| 50   | Aluminum            | X                    |             | X             |          | Tables 4-10 and 4-15 <sup>a</sup>        |
|      | Arsenic             |                      |             |               | X        | Table 4-21 <sup>a</sup>                  |
|      | Barium              |                      |             | X             |          | Table 4-15 <sup>a</sup>                  |
|      | Chromium            | X                    |             |               | X        | Tables 4-10 and 4-21 <sup>a</sup>        |
|      | Copper              |                      |             | X             |          | Table 4-15 <sup>a</sup>                  |
|      | Iron                |                      |             | X             | X        | Tables 4-15 and 4-21 <sup>a</sup>        |
|      | Lead                |                      |             | X             | X        | Tables 4-15 and 4-21 <sup>a</sup>        |
|      | Manganese           | X                    |             | X             | X        | Tables 4-10, 4-15, and 4-21 <sup>a</sup> |
|      | Nickel              |                      |             |               | X        | Table 4-21 <sup>a</sup>                  |
|      | Selenium            | X                    |             |               |          | Table 4-10 <sup>a</sup>                  |
|      | Vanadium            | X                    |             |               |          | Table 4-10 <sup>a</sup>                  |
|      | Zinc                |                      |             | X             | X        | Tables 4-15 and 4-21 <sup>a</sup>        |
| 60   | Aluminum            | X                    |             |               |          | Table 4-11 <sup>a</sup>                  |
|      | Chromium            | X                    |             |               |          | Table 4-11 <sup>a</sup>                  |
|      | Selenium            | X                    |             |               |          | Table 4-11 <sup>a</sup>                  |
|      | Vanadium            | X                    |             |               |          | Table 4-11 <sup>a</sup>                  |

Table 2  
Chemicals of Concern for Ecological RiskLonghorn Army Ammunition Plant  
Karnack, Texas

| Site                | Chemical                   | Environmental Medium |             |               |          | Reference                                         |
|---------------------|----------------------------|----------------------|-------------|---------------|----------|---------------------------------------------------|
|                     |                            | Soil                 | Groundwater | Surface Water | Sediment |                                                   |
| 67                  | Aluminum                   | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
|                     | Barium                     | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
|                     | Chromium                   | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
|                     | Lead                       | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
|                     | Selenium                   | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
|                     | Vanadium                   | X                    |             |               |          | Table 4-12 <sup>a</sup>                           |
| Central Creek       | Aluminum                   |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Barium                     |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Cadmium                    |                      |             |               | X        | Table 4-23 <sup>a</sup>                           |
|                     | Copper                     |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Iron                       |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Lead                       |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Manganese                  |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
|                     | Nickel                     |                      |             |               | X        | Table 4-23 <sup>a</sup>                           |
|                     | Zinc                       |                      |             | X             |          | Table 4-17 <sup>a</sup>                           |
| Saunders Branch     | Aluminum                   |                      |             | X             |          | Table 4-18 <sup>a</sup>                           |
|                     | Arsenic                    |                      |             |               | X        | Table 4-24 <sup>a</sup>                           |
|                     | Barium                     |                      |             | X             |          | Table 4-18 <sup>a</sup>                           |
|                     | Chromium                   |                      |             |               | X        | Table 4-24 <sup>a</sup>                           |
|                     | Iron                       |                      |             | X             |          | Table 4-18 <sup>a</sup>                           |
|                     | Lead                       |                      |             | X             |          | Table 4-18 <sup>a</sup>                           |
|                     | Manganese                  |                      |             | X             |          | Table 4-18 <sup>a</sup>                           |
| Goose Prairie Creek | Aluminum                   |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     | Barium                     |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     | Chromium                   |                      |             | X             | X        | Tables 4-16 and 4-22 <sup>a</sup>                 |
|                     | Copper                     |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     | Iron                       |                      |             | X             | X        | Tables 4-16 and 4-22 <sup>a</sup>                 |
|                     | Lead                       |                      |             | X             | X        | Tables 4-16 and 4-22 <sup>a</sup>                 |
|                     | Manganese                  |                      |             | X             | X        | Tables 4-16 and 4-22 <sup>a</sup>                 |
|                     | Mercury                    |                      |             |               | X        | Table 4-22 <sup>a</sup>                           |
|                     | Nickel                     |                      |             |               | X        | Table 4-22 <sup>a</sup>                           |
|                     | Selenium                   |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     | Silver                     |                      |             | X             | X        | Tables 4-16 and 4-22 <sup>a</sup>                 |
|                     | Zinc                       |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     | Bis(2-ethylhexyl)phthalate |                      |             | X             |          | Table 4-16 <sup>a</sup>                           |
|                     |                            |                      |             |               |          |                                                   |
| Caddo Lake          | Arsenic                    |                      |             |               | X        | Table 4-25 <sup>a</sup> , Table 4-19 <sup>b</sup> |
|                     | Cadmium                    |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Chromium                   |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Copper                     |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Iron                       |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Lead                       |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Manganese                  |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Mercury                    |                      |             |               | X        | Table 4-25 <sup>a</sup> , Table 4-19 <sup>b</sup> |
|                     | Nickel                     |                      |             |               | X        | Table 4-25 <sup>a</sup> , Table 4-19 <sup>b</sup> |
|                     | Silver                     |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Zinc                       |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Benzo(a)anthracene         |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Benzo(a)pyrene             |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Chrysene                   |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Fluoranthene               |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |
|                     | Phenanthrene               |                      |             |               | X        | Table 4-25 <sup>a</sup>                           |

**Notes and Abbreviations:**

This table shows the LHAAP sites and ecological chemicals of concern (COCs) associated with exposures to concentrations in soil, surface water, or sediment (marked by "X"). In order to demonstrate a groundwater to surface water pathway, human health COCs in the groundwater are also shown (marked by "H"). Reference documents that justify the "X" or "H" entry are shown in the reference column with the source table cited.

<sup>a</sup> Jacobs Engineering Group, Inc., 2003, *Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60, 67, Goose Prairie Creek, Saunders Branch, Central Creek, and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, June.

<sup>b</sup> Jacobs Engineering Group, Inc., 2002a, *Draft Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites, 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, April.

<sup>c</sup> Jacobs Engineering Group, Inc., 2001c, *Final Screening Ecological Risk Assessment, A Supplement to the Remedial Investigation Report, Site 16 Landfill, Longhorn Army Ammunition Plant, Karnack, Texas*, October.

H indicates that the chemical is also a human health COC (see also Table 1)

X indicates chemical concentration exceeds one or more ecological benchmark criteria and is an ecological COC

**Table 3**  
**Fate and Transport Modeling Locations**

**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Modeling Location <sup>a</sup> | Source Medium Modeled | Modeling Type                          | Modeling Path <sup>a</sup> |                     | Chemical Modeled <sup>b,c,d,f</sup>                                          |
|--------------------------------|-----------------------|----------------------------------------|----------------------------|---------------------|------------------------------------------------------------------------------|
|                                |                       |                                        | From                       | To                  |                                                                              |
| Sites 04, 35A <sup>e</sup>     | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Sites 04, 35A              | Sites 04, 35A       | PCE, TCE, 1,1-dichloroethane<br>perchlorate<br>phthalate esters              |
| 1.                             | Soil                  | Soil Runoff to Surface Water, Sediment | Sites 04, 32, 35A          | Goose Prairie Creek | phthalate esters<br>perchlorate<br>2,4,6-trinitrotoluene<br>phthalate esters |
|                                | Soil                  | Soil Leaching to Groundwater           | Site 04                    | Groundwater         | perchlorate                                                                  |
|                                | Soil                  | Soil Runoff to Surface Water, Sediment | Site 35A                   | Goose Prairie Creek | phthalate esters                                                             |
|                                | Groundwater           | Groundwater to Surface Water, Sediment | Sites 04, 35A              | Goose Prairie Creek | PCE, TCE, 1,1-dichloroethane<br>perchlorate<br>phthalate esters              |
| Sites 29, 32 <sup>e</sup>      | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Sites 29, 32               | Sites 29, 32        | TCE, VOCs 1<br>perchlorate<br>Nitrotoluenes 2                                |
| 2.                             | Soil                  | Soil Runoff to Surface Water, Sediment | Site 32                    | Goose Prairie Creek | 2,4,6-TNT, Nitrotoluenes 2                                                   |
|                                | Groundwater           | Groundwater to Surface Water, Sediment | Sites 29, 32               | Goose Prairie Creek | TCE, VOCs 1<br>perchlorate<br>Nitrotoluenes 2                                |
| Site 12 <sup>e</sup>           | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Site 12                    | Site 12             | PCE<br>perchlorate<br>phthalate esters                                       |
| 3.                             | Groundwater           | Groundwater to Surface Water, Sediment | Site 12                    | Central Creek       | PCE<br>perchlorate<br>phthalate esters                                       |
| 4.                             | Groundwater           | Groundwater to Surface Water, Sediment | Site 12                    | Drainage Way        | PCE<br>perchlorate<br>phthalate esters                                       |



032146

Shaw Project No. 845714  
March 2004

Table 3  
Fate and Transport Modeling Locations

Longhorn Army Ammunition Plant  
Karnack, Texas

| Modeling Location <sup>a</sup><br>Site 16 <sup>b</sup> | Source Medium Modeled | Modeling Type                          | Modeling Path <sup>a</sup> |                     | Chemical Modeled <sup>b,c,d,f</sup>                      |
|--------------------------------------------------------|-----------------------|----------------------------------------|----------------------------|---------------------|----------------------------------------------------------|
|                                                        |                       |                                        | From                       | To                  |                                                          |
| 5.                                                     | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Site 16                    | Site 16             | TCE<br>perchlorate<br>phthalate esters                   |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Site 16                    | Harrison Bayou      | TCE<br>perchlorate<br>phthalate esters                   |
| 6.                                                     | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Sites 17, 18/24            | Sites 17, 18/24     | TCE, VOCs 2<br>perchlorate                               |
|                                                        | Soil                  | Soil Runoff to Surface Water, Sediment | Site 17                    | Ditches at Ave. Q   | Nitrotoluenes 1                                          |
| 7.                                                     | Soil                  | Soil Leaching to Groundwater           | Sites 17, 18/24            | Groundwater         | Nitrotoluenes 1                                          |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Sites 17, 18/24            | Harrison Bayou      | TCE, VOCs 2                                              |
| 8., 9., and 10.                                        | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Sites 35B, 47, 50          | Sites 35B, 47, 50   | PCE, TCE, TCA, VOCs 4<br>perchlorate                     |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Site 35B, 47, 50           | Goose Prairie Creek | phthalate esters<br>PCE, TCE, TCA, VOCs 4<br>perchlorate |
| 11.                                                    | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Site 67                    | Site 67             | phthalate esters<br>TCE, TCA, 1,1-dichloroethene         |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Site 67                    | Central Creek       | TCE, TCA, 1,1-dichloroethene                             |

**Table 3**  
**Fate and Transport Modeling Locations**  
**Longhorn Army Ammunition Plant**  
**Karnack, Texas**

| Modeling Location <sup>a</sup><br>Site 48 <sup>e</sup> | Source Medium Modeled | Modeling Type                          | Modeling Path <sup>a</sup> |                | Chemical Modeled <sup>b,c,d,f</sup> |
|--------------------------------------------------------|-----------------------|----------------------------------------|----------------------------|----------------|-------------------------------------|
|                                                        |                       |                                        | From                       | To             |                                     |
| 12.                                                    | Shallow groundwater   | Shallow to Intermediate Groundwater    | Site 48                    | Site 48        | PCE, TCE                            |
|                                                        | Soil                  | Soil Runoff to Surface Water, Sediment | Site 48                    | Groundwater    | perchlorate                         |
|                                                        | Groundwater           | Soil Leaching to Groundwater           | Site 48                    | Central Creek  | vinyl chloride                      |
|                                                        |                       | Groundwater to Surface Water, Sediment | Site 48                    | Central Creek  | vinyl chloride<br>PCE, TCE          |
| 13.<br>14.                                             | Shallow Groundwater   | Shallow to Intermediate Groundwater    | Site 35C                   | Site 35C       | perchlorate                         |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Site 35C                   | Central Creek  | TCE, 1,1-dichloroethene             |
|                                                        | Groundwater           | Groundwater to Surface Water, Sediment | Site 35C                   | Harrison Bayou | TCE, 1,1-dichloroethene             |

<sup>a</sup> Notes and Abbreviations

<sup>a</sup> See Figure 1.

<sup>b</sup> See Table 1.

<sup>c</sup> Jacobs Engineering Group, Inc., 2002c, *Draft Final Feasibility Study for the Group 2 Sites, Sites 12, 16, 17, 18/24, 29, 32, and 49, Longhorn Army Ammunition Plant, Karnack, Texas*, October.

<sup>d</sup> Jacobs Engineering Group, Inc., 2002d, *Draft Final Feasibility Study for the Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60, 67, Goose Prairie Creek, Saunderson's Branch, Central Creek, and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, October.

<sup>e</sup> Modeling location shown indicates that available data will be evaluated to determine whether shallow and intermediate groundwater units are connected, and will be modeled as accordingly.

<sup>f</sup> Not every chemical will be modeled at every site mentioned. See Table 1 for specific chemical(s) to be modeled.

2,4,6-TNT trinitrotoluene  
Nitrotoluenes 1 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene  
Nitrotoluenes 2 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene  
PCE tetrachloroethene and degradation products: trichloroethene (TCE), dis-1,2-dichloroethene, and vinyl chloride  
Phthalate Esters bis(2-ethylhexyl)phthalate or di-n-butylphthalate as indicated by source medium  
TCA 1,1,2-trichloroethane and degradation products: 1,2-dichloroethane and vinyl chloride  
TCE trichloroethene and degradation products: dis-1,2-dichloroethene and vinyl chloride  
VOCs 1 1,2-dichloroethane, methylene chloride, and chloroform  
VOCs 2 1,1-dichloroethene, 1,2-dichloroethane, methylene chloride, and chloroform  
VOCs 3 1,1-dichloroethene and 1,2-dichloroethane

*Figures*



DRAWING NUMBER 845714-B36

APPROVED BY F. EDSON 3/16/04

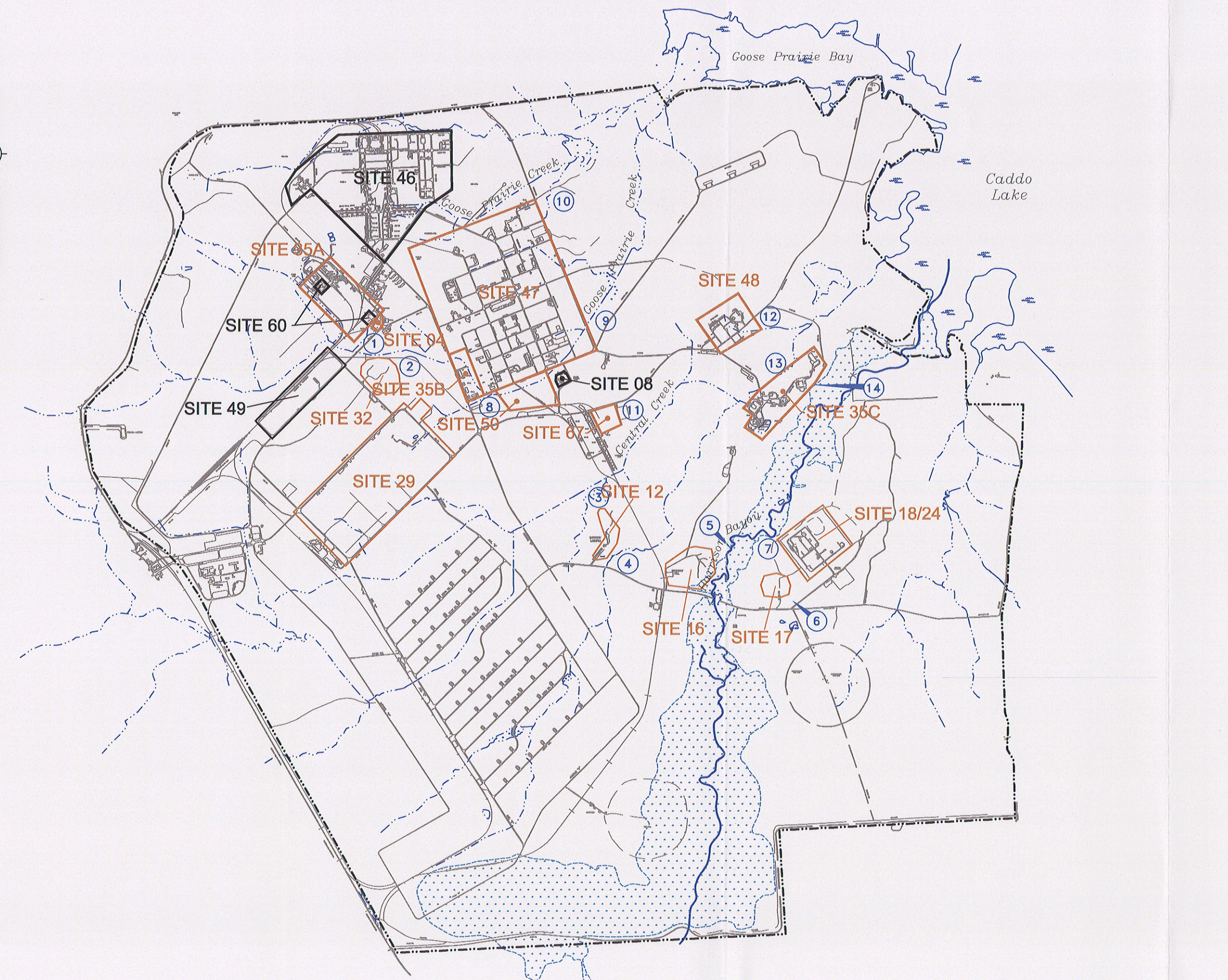
CHECKED BY J. PATIN 3/16/04

DRAWN BY J. ROZ 10/06/03

OFFICE Houston, Texas

X-REF BASE

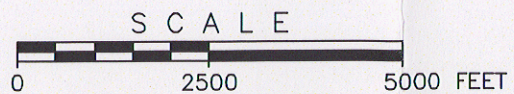
PLOT DATE: 3/16/04  
FORMAT REVISION 3/25/99



- LEGEND:
- SITES TO BE INVESTIGATED
  - WATER SUPPLY WELLS
  - STREAMS
  - CREEK/BAYOU
  - INDICATES MODELING LOCATION

- SITE 04 PILOT WASTEWATER TREATMENT PLANT
- SITE 08 SEWAGE TREATMENT PLANT
- SITE 12 LANDFILL 12
- SITE 16 LANDFILL 16
- SITE 17 BURING GROUND No. 2 AND FLASHING AREA
- SITE 18/24 BURNING GROUND No. 3/ UNLINED EVAPORATION POND FORMER TNT PRODUCTION AREA
- SITE 29 FORMER TNT WASTE DISPOSAL AREA
- SITE 32 FORMER TNT WASTE DISPOSAL AREA
- SITE 35A SHOP AREA
- SITE 35B CHEMICAL LABORATORY
- SITE 35C STATIC TEST AREA
- SITE 46 PLANT 2 AREA
- SITE 47 PLANT 3 AREA
- SITE 48 Y-AREA
- SITE 49 ACID STORAGE AREA
- SITE 50 FORMER SUMP WATER TANK
- SITE 60 PESTICIDE STORAGE BUILDINGS
- SITE 67 ABOVEGROUND STORAGE TANK FARM

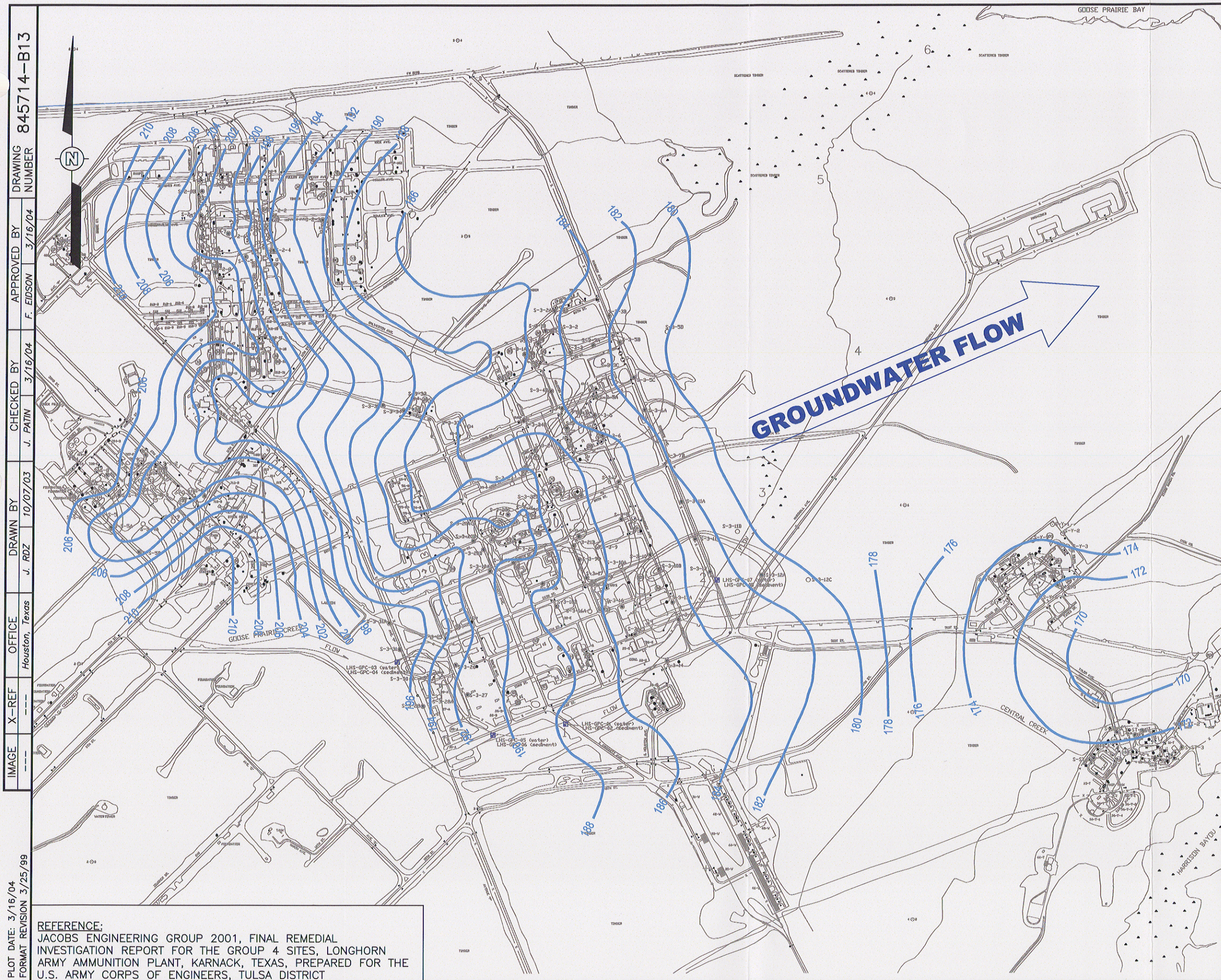
REFERENCE:  
JACOBS ENGINEERING GROUP 2002b, DRAFT FEASIBILITY STUDY FOR THE GROUP 4 SITES, LONGHORN AMMUNITION PLANT, PREPARED FOR THE U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT



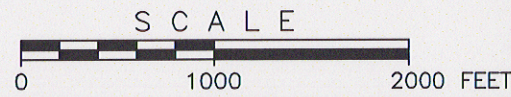
U.S. ARMY CORPS OF ENGINEERS  
TULSA DISTRICT  
TULSA, OKLAHOMA

FIGURE 1  
MODELING LOCATIONS  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS





LEGEND:  
 — POTENTIOMETRIC SURFACE CONTOUR  
 (DECEMBER 1998 DATA)



U.S. ARMY CORPS OF ENGINEERS  
 TULSA DISTRICT  
 TULSA, OKLAHOMA

**FIGURE 2**  
**SHALLOW GROUNDWATER ELEVATION**  
**CONTOUR MAP (DECEMBER 1998 DATA)**  
 LONGHORN ARMY AMMUNITION PLANT  
 KARNACK, TEXAS

IMAGE X-REF ---  
 OFFICE Houston, Texas  
 DRAWN BY J. RDZ  
 CHECKED BY J. PATN  
 APPROVED BY F. EIDSON  
 DRAWING NUMBER 845714-B13  
 PLOT DATE: 3/16/04  
 FORMAT REVISION 3/25/99

REFERENCE:  
 JACOBS ENGINEERING GROUP 2001, FINAL REMEDIAL  
 INVESTIGATION REPORT FOR THE GROUP 4 SITES, LONGHORN  
 ARMY AMMUNITION PLANT, KARNACK, TEXAS, PREPARED FOR THE  
 U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT



**END OF DOCUMENT**

**Agenda**  
**Longhorn Manager's Meeting**  
**10<sup>th</sup> floor West Conference Room**  
**EPA Region 6 Headquarters**  
**1445 Ross Ave, Dallas**  
**Wednesday April 21, 9:00 AM**

1. Sampling status
2. Status of submittal reviews
3. Site 32 FS
4. Use of Fish and Wildlife data for ERA
5. Property transfer update
6. ECOP comments
7. Environmental and transfer schedule
8. OE training
9. MMRP site signage

Note: From Love Field, turn right on Mockingbird Lane to Harry Hines. Turn left and drive 4 miles to downtown where it becomes North Akard St. Turn right onto Ross Ave to the EPA office in the Fountain Place at the end of the block on the right. Check in at the 7<sup>th</sup> floor reception area.



**Location:** Dallas, Texas  
**Date:** April 21, 2004

[illegible]



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**Subject: Draft Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting: EPA, Region 6 Office, Dallas, Texas**

**Date of Meeting: April 21, 2004, 9:00 – 1:30 PM**

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**Meeting Participants:**

**BRAC:** Rose M. Zeiler

**USAEC:** Jeff Armstrong (phone)

**USACE-Tulsa:** Andy Obrochta, Cliff Murray, Susan Trussell

**Shaw Environmental:** Praveen Srivastav, Kay Everett, Prabal Amin, Agnes Mayila (phone), Mark Weisberg (phone), Jon Lindberg (phone)

**USEPA Region 6:** Chris Villarreal, Susan Roddy

**TCEQ:** Jim Sher, Tom Emy

**USFWS:** Paul Bruckwicki, Barry Forsythe (phone)

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**Sampling Status**

Cliff Murray, USACE-Tulsa, began the presentation by describing the results of groundwater sampling conducted at Sites 12 and 16 and the delineation of perchlorate in the soil at the perchlorate further investigation area (FIA). (Two handouts—map and sampling location)

Groundwater sampling was conducted during the last two weeks of February 2004 and the perchlorate delineation was conducted on February 25 and 26, 2004. The quarterly sampling of perimeter wells at Harrison Bayou and Gooseberry Creek was conducted during the last week of March 2004. Results expected in 1-2 weeks.

During the first sampling event of 2002, conducted by the Fish & Wildlife Service, perchlorate was identified in the surface soils 0-0.5 feet. A sampling point located south of the magazine area indicated a perchlorate hit of 269  $\mu\text{g/kg}$ . (See sampling location map, lower left.)

The confirmation sampling effort conducted in 2004 by the USACE utilized the Method 8321, the best available method at this time that uses IC with mass spectrometer. The detection limits were  $<3 \mu\text{g/kg}$ . Perchlorate was not detected in any of the samples collected by the USACE. Jim Sher, TCEQ, said that the solubility for perchlorate is high, and a justification needs to be made regarding the decision to not sample deeper than 5 feet from surface. He, however, added that the probability of deeper soil contamination at the perchlorate FIA is low

because perchlorate in the majority of surface samples is non-detect. He suggested that any future consideration with perchlorate as a potential contaminant of concern should address taking the sampling deeper to confirm that no vertical migration has occurred.

It was discussed whether a "technical letter" could be issued that would close out this area. Rose Zeiler, BRAC, stated that the Army would provide the sampling results with a letter to the regulators. She indicated that the Army would like to receive a letter from the TCEQ and EPA concurring that there is no perchlorate contamination in this area and it can be transferred.

#### Sampling Status of Streams:

There was low flow in the streams as compared to past sampling.

Results from sampling are expected in about 1.5 weeks. Data will need to be validated. The fish tissue samples collected by the EPA are currently being worked on by a EPA lab in Houston. Validation of some data is also underway.

#### Status of Submittal Reviews

Praveen Srivastav presented a table of the status of technical documents. Copies of the table were distributed to meeting participants.

--Revised Draft-Final FS Site 12 in review with regulators. EPA might provide comments in two weeks.

--Draft Final Soils Report, Background Study in review with regulators.

--Draft ECOP public review in progress.

--Revised Draft Final FS, Site 32 Army review completed. Contents were presented in today's meeting.

#### Site 32 FS

Presentation copy distributed to meeting participants.

TCEQ questioned the quantity of soil/sediment removal and said more data is needed before utilizing the excavation and disposal alternative. TNT bioremediation in soils is being utilized at many DOD sites and may be used at Site 32. Conducting bioremediation of some type may require the destruction of many trees, resulting in the undesirable loss of habitat. It was agreed that Shaw would further explore the applicability of bioremediation of TNT at Site 32, even though it was screened out as a viable alternative in the current version of the FS. Prabal Amin, Shaw, pointed out that presence of TNT would make the contaminated soil a listed waste.

The regulators would have to provide guidance on TNT levels at which the waste could be considered delisted, if the soil is bioremediated. Additional sampling may be required to confirm vertical and aerial contamination and to ascertain whether groundwater in the area has been impacted. Previous groundwater sampling at the site occurred about four years ago. TCEQ and EPA indicated that institutional controls in the form of deed restrictions and



periodic inspections would be required at Site 32 if cleanup is performed to industrial levels and not to residential.

#### **Use of Fish and Wildlife Data for ERA**

General comment regarding Site 45 made by Chris Villarreal, EPA, that, according to USACHPPM data available, the requested letter for categorizing Site 45 as Category 1-4 for transfer is not appropriate because he doesn't think the concentrations are below screening levels for ecological receptors. Especially, arsenic levels are high. Also, the identified "warehouse area" needs to be addressed and should be identified as a site for restoration.

Evaluation of data from Site 45 should take into account USACHPPM and all the Fish & Wildlife Service samples. Chris Villarreal, stated that the USFWS samples totaled 22, rather than the 12 that were considered by Shaw in their evaluation. (The 12 points used were found within the Site 45 boundary as shown in published documents; the additional 10 are found between the site boundary and the fence.) Also note that there is a "magazine area" and "magazines area", two independent sites. Consistency of nomenclature is recommended.

#### **Property Transfer Update**

Rose Zeiler stated that Site 45 and the warehouse area would be excluded from the initial transfer on May 5, 2004. An additional area of approximately 1,200 acres may be transferred by end of 2004.

#### **ERA Comments**

Susan Roddy with the EPA stepped in and distributed comments entitled "Response to Army's Response to EPA Comments on their Approach for the Installation-Wide Ecological Risk Assessment for Longhorn AAP." Major concerns were noted. Additional discussion is planned with Susan Roddy, EPA; Vickie Reat, TCEQ; Laura Benneyworth, USACE, Nashville; Chip Wood, TPWD; Mark Weisberg and Jon Lindberg with Shaw on Monday at 2:00 PM (CST).

#### **ECOP Comments**

Paul Bruckwicke discussed comments made by USFWL on the draft ECOP. He indicated that formal comments would be provided via fax and email.

#### **OE Training**

OE training is *tentatively* scheduled for June 3, in conjunction with the June TRC meeting at Longhorn. Jeff Armstrong, AEC, is setting up the PBC meeting tentatively on June 2. Please block June 1-3, but it is planned that OE training could be performed on the same day as the TRC meeting. Firm dates are forthcoming.

#### **MMRP Site Signage**

There were some discussions on the type of signage to be placed near MMRP sites after the transfer. No consensus was reached.

#### **Action Items**

- Shaw to reevaluate analytical data at Site 45 utilizing 22 data locations collected by USFWL and including USACHPPM data.

- Shaw to arrange an initial conference call to discuss TCEQ and EPA comments on the installation-wide risk assessment. The call was scheduled for Monday, April 26, 2004, at 2:00 PM (CST).
- Shaw to send one hardcopy of Sediment Sampling Report to Jim Sher, TCEQ.
- Shaw to send a CD of Sediment Sampling Report to Chris Villarreal, EPA, Region 6.
- The submittal of Site 32 Feasibility Study for team review is on hold until additional sampling of soil and groundwater is performed.
- EPA and TCEQ to provide guidance on characterization of TNT contaminated waste that will be generated during the remedial phase (i.e. K-listed or characteristic hazardous waste) in order to determine waste management regarding costs and long-term/short-term impacts.
- EPA and TCEQ also to provide guidance on when the waste would be considered delisted if the waste is bioremediated ex situ.
- Add "warehouse area" as a site for further investigation and remove from the May 5, 2004 transfer.
- Submit a copy of this meeting's minutes to Wilma Subra.
- Submit Site 32 FS presentation to participants.

# Sampling Status

- **Sites 12 & 16**

Sampled last two weeks of Feb 04.  
Results received awaiting validation.

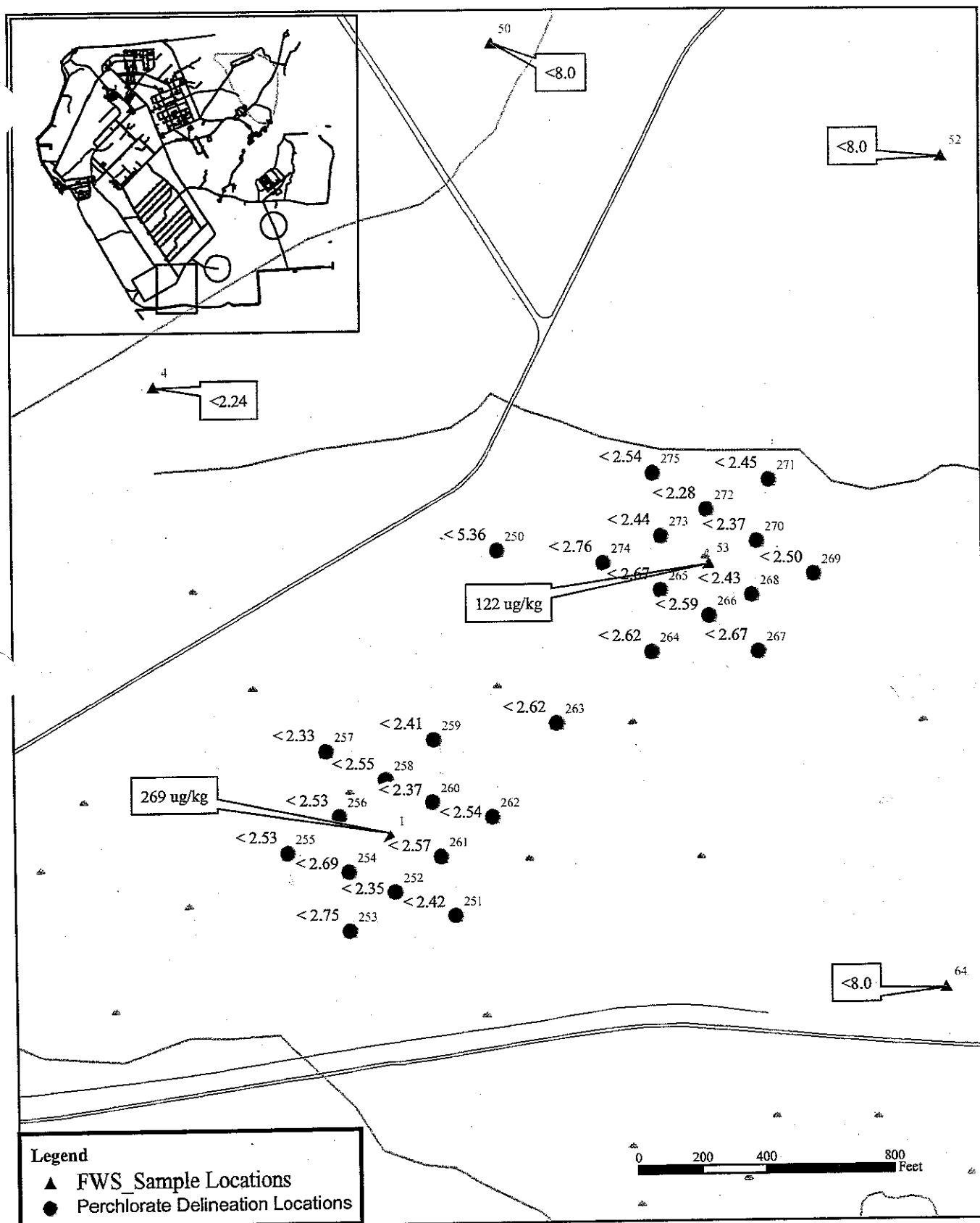
- **Perchlorate Delineation**

Samples collected 25-26 Feb 04. No  
detections.

- **Quarterly Sampling**

Perimeter Wells, Harrison Bayou, Goose  
Prairie Creek sampled last week of March





LONGHORN ARMY AMMUNITION PLANT  
 Perchlorate Delineation Sample Locations  
 Sample Depth: 0-0.5'  
 Samples collected 25 February 2004

20 April 2004

**Status of Technical Documents**  
**Longhorn Army Ammunition Plant**  
**Monthly Managers Meeting**  
**April 21, 2004**

| No. | Documents in Progress                                                | Due Date | Actual Submittal Date | Comments Due/Received from USACE/ Regulators | Comment Resolution | Status                                              |
|-----|----------------------------------------------------------------------|----------|-----------------------|----------------------------------------------|--------------------|-----------------------------------------------------|
| 1   | Revised Draft-Final Rev 01/ Feasibility Study, Site-12 to regulators | 2/27/04  | 2/27/04               | 3/26/04                                      | 4/25/04            | Submitted, in review.                               |
| 2   | Sediment Sampling Report, Caddo Lake, Final                          | 4/15/04  | 4/8/04                | NA                                           | NA                 | Submitted.                                          |
| 3   | Draft Final Soils Report – Background Study                          | 3/31/04  | 3/01/04               | 4/05/04                                      |                    | Submitted, In review.                               |
| 4   | LHAAP-32 Revised Draft Final Feasibility Study Report to COE         | 3/10/04  | 3/10/04               | 4/20/04                                      | 4/27/04            | Comment resolution in progress                      |
| 5   | LHAAP-32 Revised Draft Final Feasibility Study Report to Team        | 5/13/04  |                       |                                              |                    | In preparation                                      |
| 6   | Draft ECOP document for public and regulatory review                 | 3/17/04  | 3/17/04               | 4/18/04                                      | 4/23/04            | Submitted, Public and regulatory review in progress |
| 7   | Final ECOP document                                                  | 4/28/04  |                       |                                              |                    | Comment resolution pending                          |
| 8   | Draft Proposed Plan for LHAAP-12                                     | 5/14/04  |                       |                                              |                    | In preparation                                      |

# LHAAP-32 Feasibility Study (FS) Overview

## LHAAP-32, Group 2 Longhorn Army Ammunition Plant Karnack, Texas

Presented by: Prabal Amin, P.E.  
Shaw Environmental and Infrastructure, Inc.

April 21, 2004



Shaw Environmental & Infrastructure, Inc.

LHAAP-32

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## Purpose of the FS:

- To develop and evaluate remedial alternatives to address LHAAP-32 contamination.
- Provide a basis for selecting a remedy consistent with the intended future use of LHAAP-32 as a wildlife refuge.

# FS Organization:

- **Section 1 – Introduction**

- States the purpose, describes LHAAP background, and describes human health risk assessment approach.

- **Section 2 – Site Description**

- Describes LHAAP-32 site background, summarizes previous sampling investigations and human health risk assessment, and discusses site media problems.

- **Section 3 – Remedial Action Objective and Remediation Levels**

- Defines remedial action objective and discusses applicable or relevant and appropriate requirements (ARARs), and remediation levels.

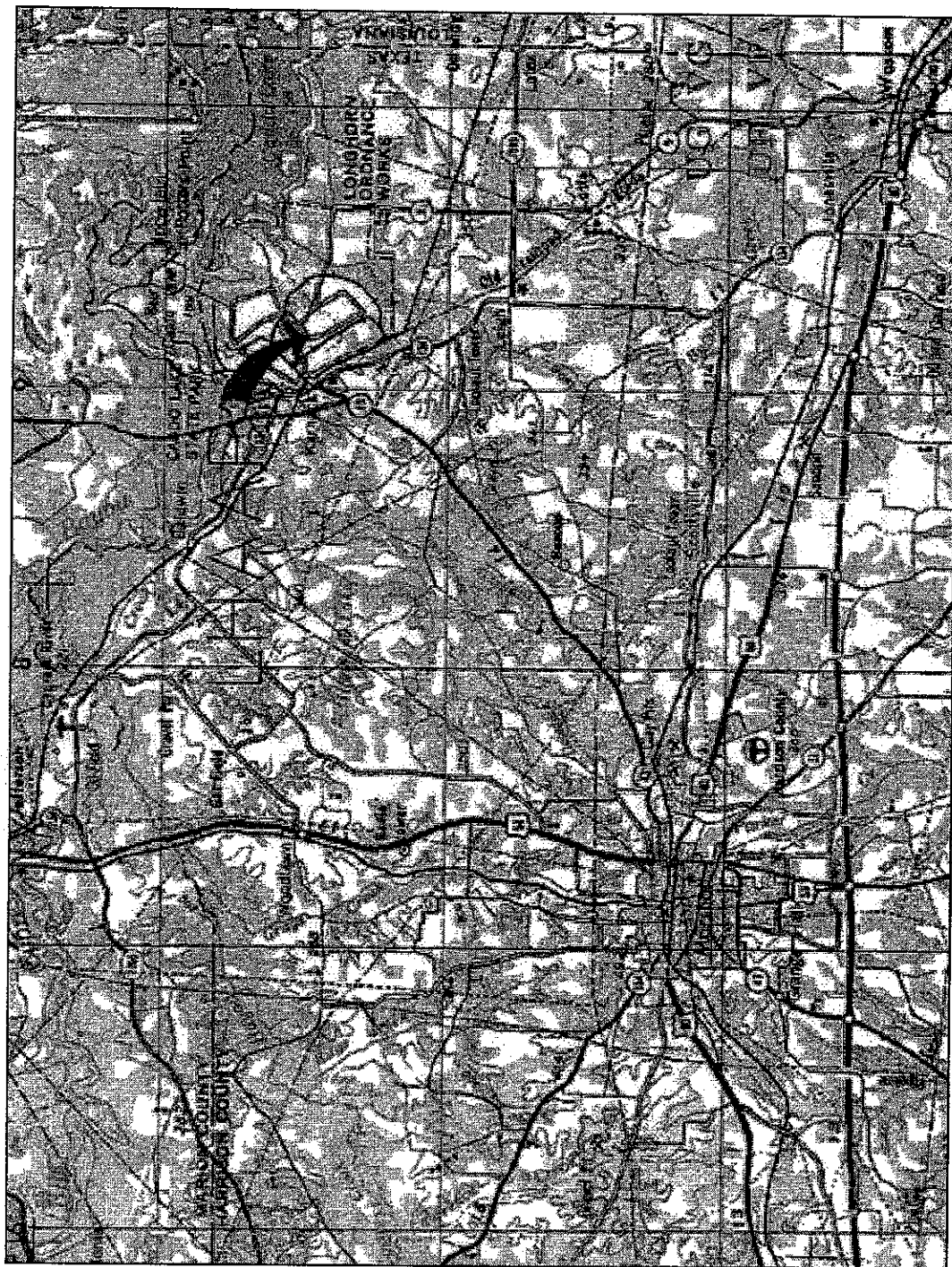
## **FS Organization (Continued):**

- **Section 4 – Identification and Screening of Technologies and Process Options**
  - Identifies areas and volumes requiring remedial action and provides screening of remedial technologies and process options against effectiveness, implementability, and cost.
- **Section 5 – Development and Description of Alternatives**
  - Combines process options to form remedial alternatives.
- **Section 6 – Detailed Analysis of Alternatives**
  - Evaluates each alternative with respect to the seven evaluation criteria in CERCLA and compares the alternatives.



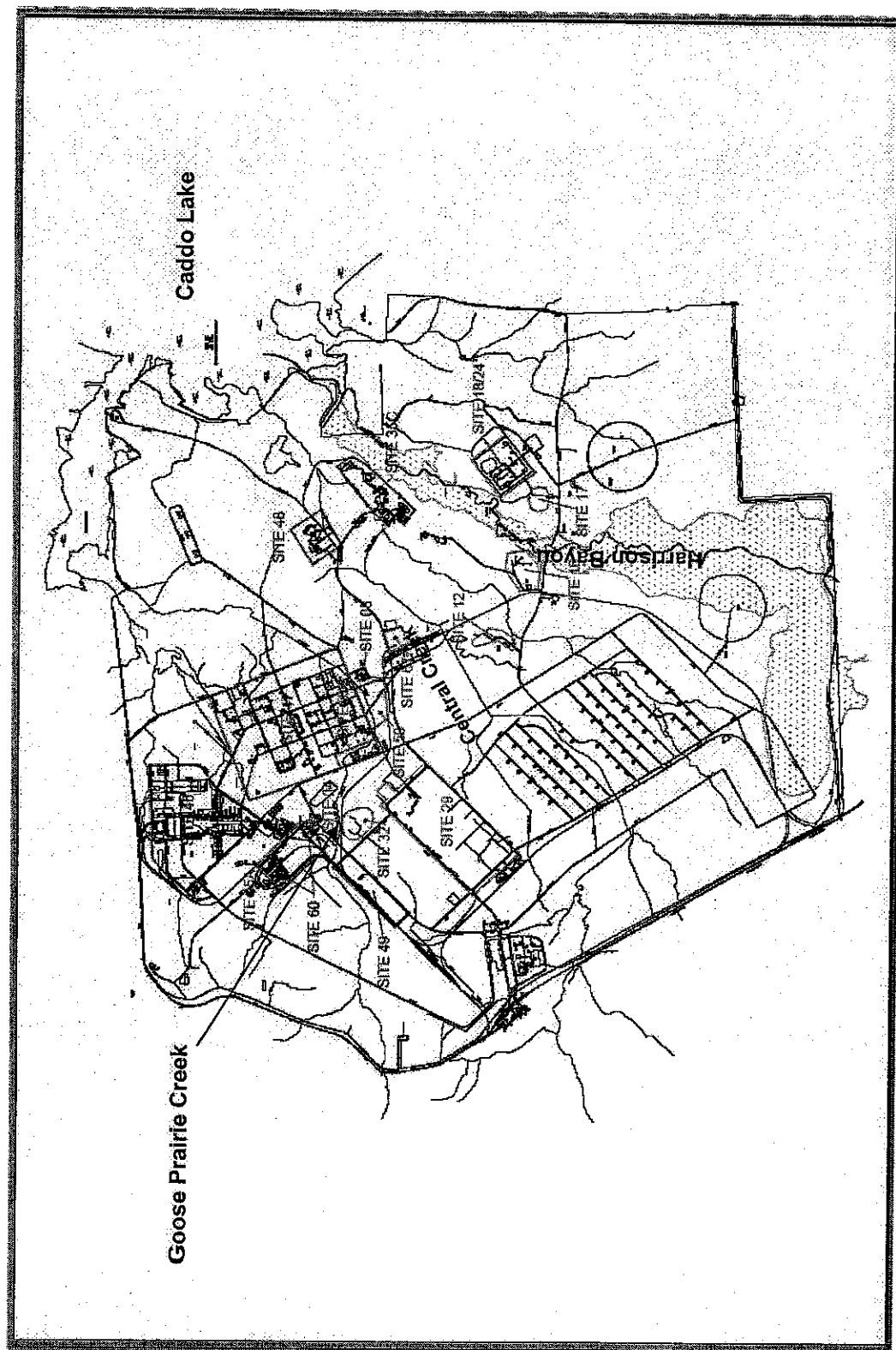
# LHAAP Location Map

## Longhorn Army Ammunition Plant, Karnack, Texas



# Site Location Map

## LHAAP-32, Longhorn Army Ammunition Plant, Karnack, Texas



# LHAAP-32 Site Background

- Also known as the former TNT Waste Disposal Plant.
- Approximately 9 acres.
- Plant operated from 1942 to 1945, treating wastewater from the TNT Production Area (LHAAP-29).
- Wastewater transferred from LHAAP-29 to LHAAP-32 via a 6-inch wooden pipeline and stored in holding tanks until treated (pipeline to be addressed as part of LHAAP-29).
- Nearest surface water body is Goose Prairie Creek located approximately 200 feet to the north.
- Site surface water runoff eventually drains into Caddo Lake via Goose Prairie Creek.
- Site contamination likely caused by leaks from tanks, pipelines, unlined ditches and process spills.



# Sampling Investigations

- Soil, groundwater, surface water and sediment sampling conducted during pre-RI and subsequent Phase I through Phase III RIs.
- Pre-RI sampling conducted by Environmental Protection Systems (EPS) in 1982.
- Phase I through III RIs conducted by Jacobs from 1993 to 1998.



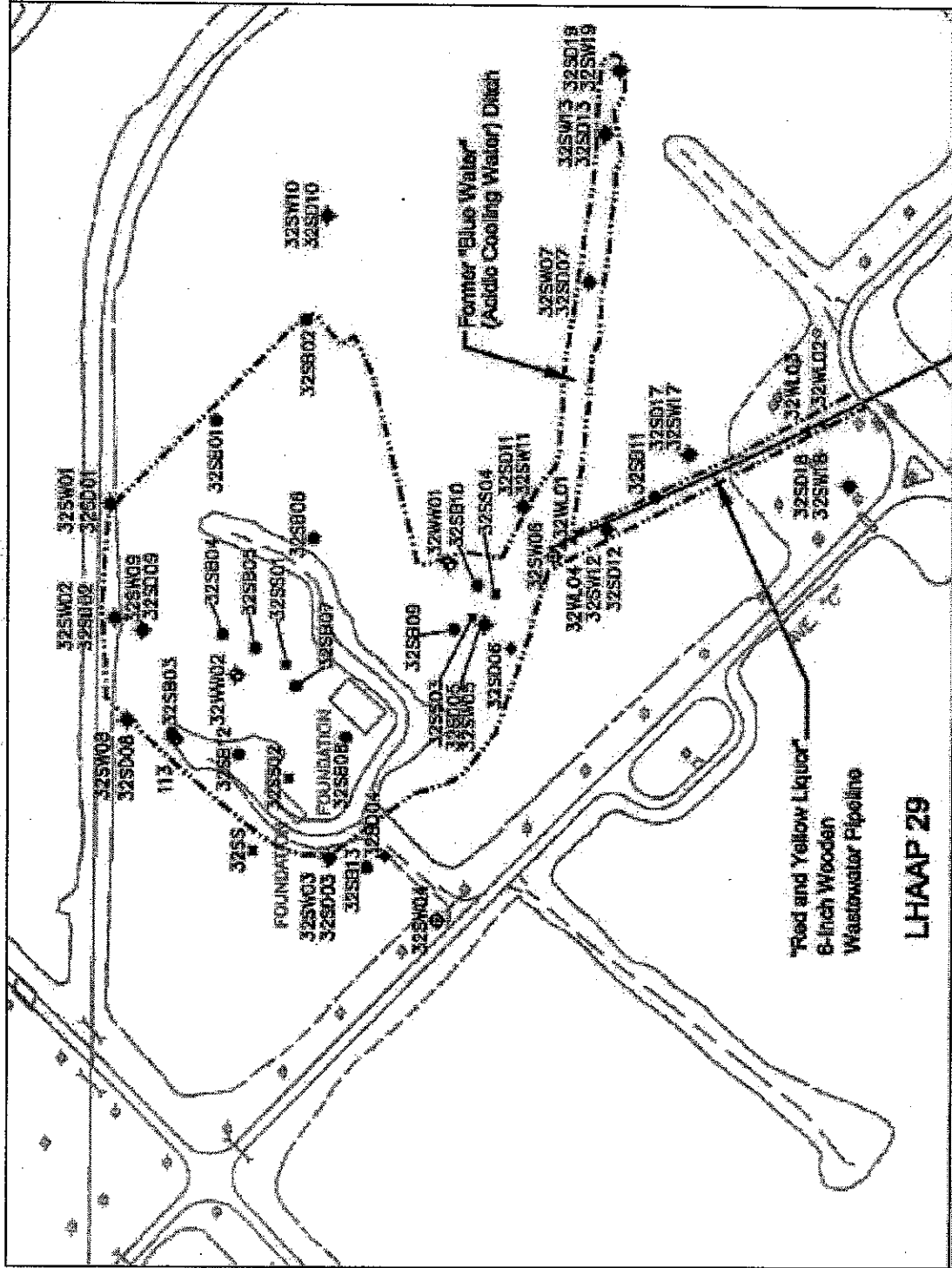
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LHAAP-32

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# Site Map with Sampling Locations LHAAP-32, Longhorn Army Ammunition Plant, Karnack, Texas



# Human Health Risk Assessment Conclusions

## Soil:

- Unacceptable cancer risk (ELCR of  $1.2 \times 10^{-3}$ ) and non-cancer hazard (HI of 230) associated with soil for future maintenance worker.
- Soil in risk assessment defined as surface soil (0-2 feet depth) and ditch sediment.
- TNT contributed nearly 100 percent to the cancer risk and non-cancer hazard.

## Groundwater:

- Cancer risk and non-cancer hazard associated with groundwater considered acceptable.



# LHAAP-32 Chemical of Concern (COC)

- COC in soil is TNT due to significant contribution to total cancer risk and non-cancer hazard.
- Maximum TNT soil concentration was detected at 57,000 mg/kg.
- Maximum concentration detected in 0-0.5 foot interval at soil sample location 32SS03 (within existing sediment pond).



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LHAAP-32

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# Remedial Action Objective (RAO)

- To prevent human exposure to soil contamination in excess of the  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  target cancer risk range and non-cancer HI of 1 for the future maintenance worker.

# ARARs/Remediation Levels

- FS identifies chemical-, location-, and action-specific ARARs.
- No promulgated regulations exist which set forth chemical-specific cleanup criteria for explosives in soil.
- Risk-based remediation level for TNT was calculated to achieve an ELCR of  $1 \times 10^{-5}$  and an HI of 1 for site soil.
- The calculated soil remediation concentrations were 460 mg/kg (ELCR of  $1 \times 10^{-5}$ ) and 250 mg/kg (HI=1).
- The soil remediation level for TNT is assumed to be the lower of the two calculated soil remediation concentrations (i.e., 250 mg/kg).





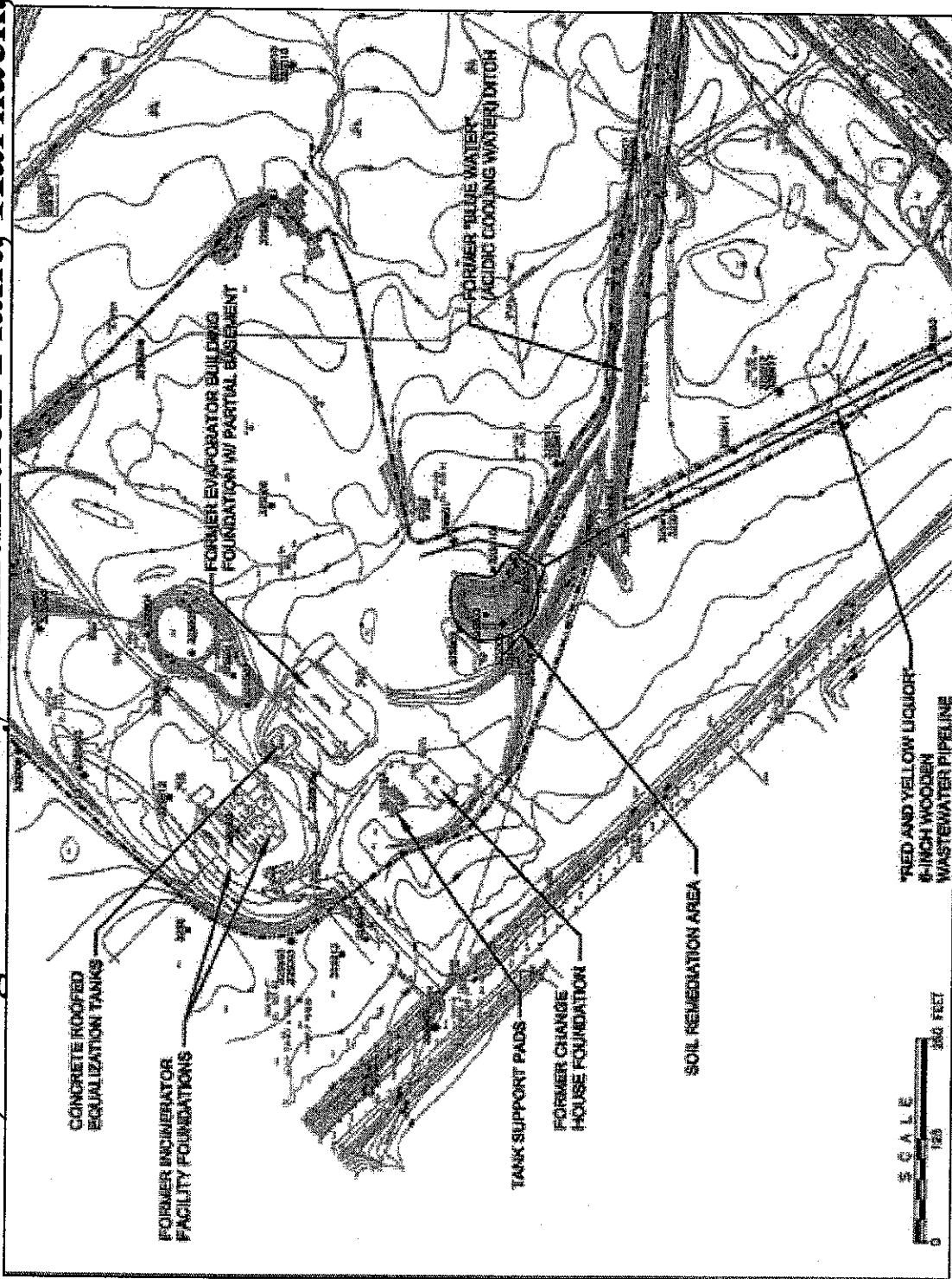
# Area and Depth Requiring Remediation

- TNT concentration exceeds remediation level in the 0-0.5 foot depth interval within sediment pond.
- TNT also detected to a depth of 5 feet within sediment pond at levels below remediation level.
- Since only one soil sample was taken from the sediment pond, additional soil delineation required during design.
- FS assumes entire sediment pond area (5,830 square feet) requires remediation.
- FS also assumes sediment pond soil to a depth of 5 feet requires remediation.



# Area Requiring Remediation

## LHAAP-32, Longhorn Army Ammunition Plant, Karnack, Texas



# Technologies Considered for Screening

- Institutional Controls (covenants/deed restrictions, administrative controls, physical barriers/security and surveillance)
- Capping (soil cover, asphalt cap , or multilayer cap)
- Conventional Excavation
- In-Situ Physical/Chemical Treatment (solidification/stabilization, soil flushing, in-situ oxidation)
- In-Situ Biological Treatment (enhanced bioremediation)
- Ex-Situ Physical/Chemical Treatment (soil washing, stabilization/solidification)
- Ex-Situ Thermal Treatment (incineration)
- Ex-Situ Biological Treatment (composting)
- Off-Site Disposal (treatment, storage, disposal facility, RCRA disposal facility, industrial landfill)
- On-Site Disposal



# Remedial Alternatives

- Alternative 1 - No Action
- Alternative 2 - Soil Cover, Institutional Controls
- Alternative 3 - Excavation, Off-Site Disposal

# Alternative 1 - No Action

The “No Action” alternative is retained throughout the FS process to provide a comparative baseline against which other alternatives can be evaluated.

Under this alternative, no remedial action would be taken.

## **Alternative 2 - Soil Cover, Institutional Controls**

- **Installs a soil cover to isolate contaminated soil**
  - Cover placed over entire area of existing sediment pond.
  - Requires placement of approximately 1,060 bank cubic yards of material.
  - Soil cover material obtained from off-site sources.
  - Cover would be seeded, fertilized, and mulched.
- **Implements institutional controls**
  - Access controls (e.g., deed restrictions, administrative controls, and physical barriers) to prevent human exposure to the covered soil and disturbance of the cover.
  - Physical inspections and routine maintenance of cover.





## Alternative 3 – Excavation, Off-Site Disposal

- Removes TNT contaminated soil exceeding the remediation level via conventional excavation.
- FS assumes entire pond area would be excavated to a depth of 5 feet, pending additional soil delineation.
- Excavated soil would be sent to an off-site RCRA hazardous waste disposal facility.
- Total estimated volume to be excavated and disposed is 1,200 bank cubic yards.

# **CERCLA Evaluation Criteria**

## **Conducted during the FS:**

- Overall protection of human health and the environment
- Compliance with the ARARs
- Long-term effectiveness and permanence
- Short-term effectiveness
- Reduction of toxicity, mobility, and volume
- Implementability
- Cost

## **Conducted during development of the Proposed Plan/ROD:**

- State acceptance
- Community acceptance

**Table ES-1  
Comparative Analysis of Alternatives**

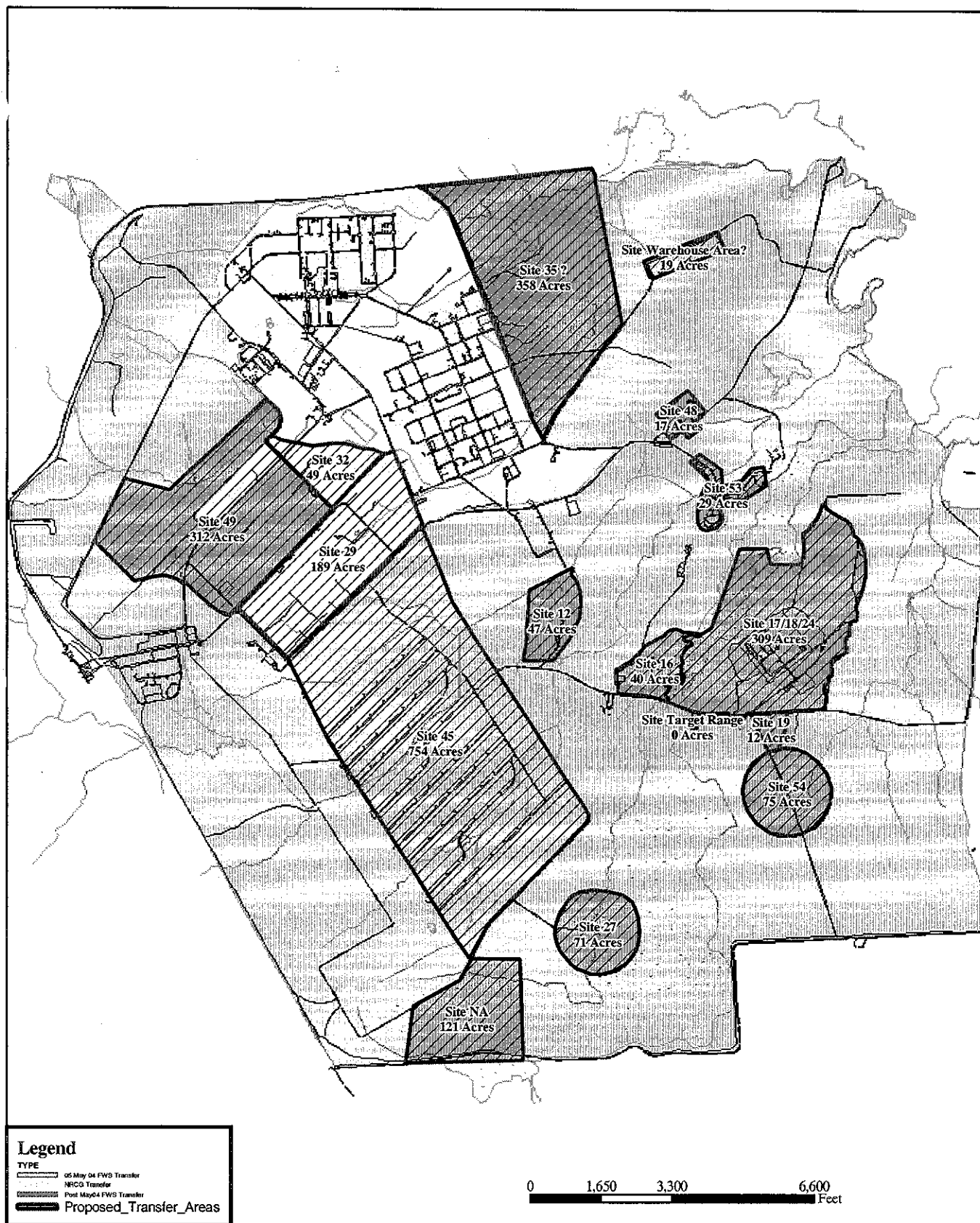
| Criteria                                                     | Alternative 1<br>No Action           | Alternative 2<br>Soil Cover, Institutional Controls                                                                                                   | Alternative 3<br>Excavation, Off-Site Disposal                                                                                                                                                                                                                          |
|--------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall protection of human health and the environment       | No protection. Does not achieve RAO. | Achieves RAO. Protection of human health and environment provided by installation of soil cover, and maintenance of cover and institutional controls. | Achieves RAO. Protection of human health and environment provided by complete removal of contaminated soil above the preliminary remediation level.                                                                                                                     |
| Compliance with ARARs                                        | ARARs would not apply.               | Chemical-specific ARARs would not apply. Complies with location- and action-specific ARARs.                                                           | Chemical-specific ARARs would not apply. Complies with location- and action-specific ARARs.                                                                                                                                                                             |
| Long-term effectiveness and permanence                       | Not effective.                       | Soil cover and institutional controls would be effective and reliable so long as they are maintained indefinitely.                                    | Effective and permanent. No future on-site management of residuals or long-term reliance on institutional controls required.                                                                                                                                            |
| Reduction of toxicity, mobility, or volume through treatment | No reduction.                        | No active reduction would be accomplished. Soil cover would reduce contaminant mobility and toxicity.                                                 | Provides permanent and irreversible contaminant reduction in the residual soil that remains after remediation.                                                                                                                                                          |
| Short-term effectiveness                                     | No short-term effect.                | Minimal impact to the community, workers, or the environment from short-term activities. Provides almost immediate protection.                        | Short-term impact to community from waste transportation and risks to workers from excavation and waste handling. Engineering controls would be required to control impacts to the environment during remedial activities (e.g., contaminant runoff during excavation). |
| Implementability                                             | Inherently implementable.            | Readily implemented.                                                                                                                                  | Implementable. Coordination required for excavation, waste transportation, and disposal activities.                                                                                                                                                                     |
| <b>Cost *</b>                                                |                                      |                                                                                                                                                       |                                                                                                                                                                                                                                                                         |
| • Capital (escalated)                                        | \$0                                  | \$380,000                                                                                                                                             | \$735,000                                                                                                                                                                                                                                                               |
| • O&M (escalated present worth)                              | \$0                                  | \$170,000                                                                                                                                             | \$0                                                                                                                                                                                                                                                                     |
| • Present worth                                              | \$0                                  | \$550,000                                                                                                                                             | \$735,000                                                                                                                                                                                                                                                               |



**Shaw Environmental & Infrastructure, Inc.**

LHAAP-32

**Notes and Abbreviations:**  
 \* Costs have been rounded to three significant figures.  
 ARAR applicable or relevant and appropriate requirement  
 O&M operation and maintenance  
 RAO remedial action objective



LONGHORN ARMY AMMUNITION PLANT  
Transfer Property Distribution





## United States Department of the Interior

FISH AND WILDLIFE SERVICE

P.O. Box 1306

Albuquerque, New Mexico 87103

In Reply Refer To:  
R2/DRD

MAY 13 2004

Craig E. Blair, Acting Director  
Real Property Disposal Division  
GSA, Greater Southwest Region  
819 Taylor Street  
Fort Worth, Texas 76102-6195

Dear Mr. Blair:

Please find two original signed transfer letters enclosed, acknowledging and accepting the first transfer of 5,031.75 acres, Tracts 100a and 100b, of the Longhorn Army Ammunition Plant (LHAAP), in Karnack, Texas, from the Department of the Army (Army) to the U.S. Department of the Interior, Fish and Wildlife Service (Service).

To further document agreements between the Army and the Service in this and future transfers at LHAAP, we have enclosed the "*Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas,*" (MOA), signed by the Interior on April 27, 2004, and by the Army on April 29, 2004. This memorandum guides the Army and the Interior in all transfer decisions. It should be noted that 75 percent of the water rights are being transferred to the Service and the Army (through GSA) retains 25 percent for now. However, the remaining 25 percent will go to the Service or another conservation group if the remaining land area is transferred to the Service or another entity through the expected conservation transfer. It is the intent of the Service to obtain all LHAAP lands cleaned up in accordance with the MOA.

As discussed with Will Morgan of your staff on May 3, 2004, that the total acreage in LHAAP is actually 8,414 acres, instead of the 8,404 as was indicated on the 1334 request from the Service and in your return transfer letter. This documents that acreage, as it was written as "more or less," Mr. Morgan did not see a need to change the transfer letter, at this point.

Thank you for your assistance in this transfer.

Sincerely,

Acting

Regional Director

Enclosures



GSA Greater Southwest Region

April 29, 2004

Mr. Geoffrey Haskett, Deputy Regional Director  
DOI, Fish and Wildlife Service Region 2  
P.O. Box 1306  
500 Gold Avenue SW  
Albuquerque, NM 87102

RE: Transfer of a Portion of Longhorn Army Ammunition Plant  
City of Karnack, Harrison County, Texas

Dear Mr. Haskett:

Your letter of April 23, 2004, requested transfer to the U.S. Department of the Interior, Fish and Wildlife Service (FWS), under the authority of P.L. 80-537, 16 U.S.C. 667b, a total of 8404 acres of land, more or less, at the Longhorn Army Ammunition Plant (LHAAP), City of Karnack, Harrison County, State of Texas, together with all the improvements found on the real estate, and all related personal property located thereon (hereinafter referred to as the "Property"), reported July 29, 2002, as excess to the needs of the U.S. Army. A true and complete legal description of all real estate found in the LHAAP is attached hereto, marked **Attachment 1**, which is hereby incorporated and made a part hereof.

All the rights to be conveyed herein has heretofore been declared excess to the needs of the United States of America by the United States Department of the Army and the respective interests to be conveyed hereby has been reported to GSA and has been determined to be excess for disposal pursuant to said Federal Property Act, (40 U.S.C. §§550, et.seq.) as amended, and the rules and regulations promulgated thereunder, pursuant to the above referred laws, regulations and orders; and,

Presently, only 5031.75 acres, more or less, Tracts 100a and 100b, are suitable for transfer (hereinafter referred to as the "Property"). A true and complete legal description of this limited portion of the real estate found in the LHAAP is also included in **Attachment 1**.

U.S. General Services Administration  
819 Taylor Street  
Fort Worth, TX 76102-6195  
[www.gsa.gov](http://www.gsa.gov)

Accordingly, pursuant to the Property Act (40 U.S.C.S. 501; et. seq.) and Public Law 80-537, 16 U.S.C. 667b, and acting under authority delegated to me, I hereby transfer 5031.75 acres, more or less, as described in **Attachment 1**, together with all the improvements thereto including the following listed improvements found on the real estate: Buildings 703B, 703D/E, DST-3, BST-4, BST-2, 702, 99-Y, 720C, Grandstand bleachers, TS-12 and the Observation enclosure, and all related personal property located thereon, without reimbursement, to the FWS. This transfer also includes the enclosed assignment of water rights described in the Assignment of Permit to Appropriate State Water, dated April 29, 2004, and the Assignment of Caddo Lake Institute, Inc., Lease, dated April 29, 2004. True and correct copies of the aforementioned assignments are attached hereto, marked **Attachments 2 and 3**, respectively, which is hereby incorporated and made a part hereof.

Additional transfers covering the remainder of the real estate comprising the LHAAP will be made when approvals are obtained from the Army on lands currently not suitable. Future requests for transfers will specifically identify such requested land by legal description and/or map overlay.

This transfer is expressly made subject to all environmental notices, exceptions, restrictions, agreements, and covenants affecting the Property identified in the Environmental Condition of Property, Longhorn Army Ammunition Plant, Karnack, Texas, dated April 2004, (hereinafter referred to as the "ECOP") which is incorporated herein by reference and made a part of this transfer as **Attachment 4**, to the extent and only to the extent the same are valid and affect the Property conveyed herein. FWS covenants and agrees that the Property is hereby transferred subject to the use restrictions and covenants which are covenants running with the land as identified in **Attachment 2 of the ECOP**. FWS further covenants and agrees that in the event that the Property, or any part thereof, is sold, conveyed, transferred, leased, or otherwise disposed of, the following notices, covenants, and restrictions shall be inserted in any instrument of conveyance.

This transfer is also expressly made subject to the leases and other outgrants listed in **Attachment 5**, which is incorporated herein by reference and made a part of this transfer, to the extent and only to the extent the same are valid and affect the Property.

Except as otherwise provided in the ECOP, this transfer is also expressly made subject to the agreements and exceptions to title listed in **Attachments 6 and 7**, respectively, which are incorporated herein by reference and made a part of this transfer, to the extent and only to the extent the same are valid and affect the Property.

Upon finalization of transfer of the total land requested by FWS, a complete boundary legal description will be provided by FWS identifying all former Army

land that had been transferred. Any map overlays used in the interim to identify previously transferred land will be voided for use to identify former Army land at LHAAP subsequently controlled by FWS.

The property transferred is subject to compliance by the FWS with the provisions of the National Environmental Policy Act of 1969, as amended, including the preparation of an environmental impact statement if required. The Property is transferred subject to compliance by the FWS with Section 106 of the National Historic Preservation Act of 1966, and Executive Order 11593.

Ms. Hyla J. Head, Chief— Real Estate Division, U.S. Army Corps of Engineers, P.O. Box 17300 Ft. Worth, TX 76102 will act for the U.S. Army Corps of Engineers in arranging for the transfer of custody and accountability of the Property and in other matters related to the transfer.

A copy of our letter of same date to the U.S. Army Corps of Engineers is enclosed for your information. It is requested that you acknowledge receipt of this communication in the space provided on the enclosed two original copies of this letter, return them to this office, and that such steps as necessary be taken by your Agency to consummate the transaction.

You may contact John Robinson of my office at telephone 817 978 4245 or William Morgan at telephone 817 978 4239 if there are questions.

Sincerely,



Craig E. Blair, Acting Director  
Real Property Disposal Division  
GSA, Greater Southwest Region

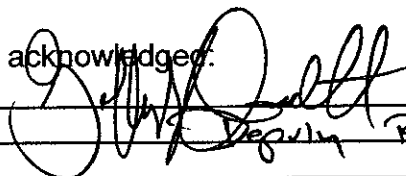
Enclosures

Receipt acknowledged.

Name

Title

Date

 4/30/04  
Deery RD

cc:

Ms. Hyla J. Head  
U.S. Army Corps of Engineers  
P.O. Box 17300  
Ft. Worth, TX 76102



# **ATTACHMENT 1**

**Tract Description of the  
United States of America Tract (100a)  
Caddo Lake National Wildlife Refuge  
Harrison County, Texas**

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, United States of America (USA) tract (100a) being part of the Longhorn Ordnance Works Reservation, also known as the Longhorn Army Ammunition Plant, Karnack, Texas, as surveyed in March, 1943 for the War Department by Milard H. Hackney, a Licensed State Land Surveyor in and for the State of Texas, said tract (100a) being more particularly described by metes and bounds as follows:

**SURVEYOR'S NOTE:**

This tract description is based on said 1943 survey and existing boundary evidence found in the field and lying within and immediately adjacent to the boundaries of said Reservation. Adjustments were made according to field evidence found. All references in the description to the Karnack-Johnson's Ranch Road are as existed at the time of said 1943 survey. All existing concrete monuments referred to in the hereinafter description are as described in said 1943 survey. All bearings and distances are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The average Combined Scale Factor applied equals 0.99988410; Convergence equals 02°21'53". The computed land area is based on surface distances.

**BEGINNING** at a standard United States Fish and Wildlife Service (USFWS) aluminum monument marked "Mon. No. 1, LS 4971, 2004" set for a corner of this tract in the north boundary of said Reservation and in the south Right of Way (R.O.W.) of Texas Farm to Market Highway No. 2198 (FM 2198), said point having a coordinate value of N=6963934.80, E=3302120.30. The Original Point of Beginning, Monument #1, and the original Triangulation Station "Longhorn", as described in said 1943 survey, has been destroyed;

**THENCE**, along the north boundary of said Reservation and the south R.O.W. of said FM 2198,

N. 87°20'09" E., 241.13 feet

to a standard USFWS aluminum monument marked "Mon. No. 2, LS 4971, 2004" set for a corner of this tract in the north boundary of said Reservation;

**THENCE**, continuing along the north boundary of said Reservation and the south R.O.W. of said FM 2198,

N. 87°20'09" E., 1792.04 feet

to a standard USFWS aluminum monument marked "Mon. No. 3, LS 4971, 2004" set for a corner of this tract in the north boundary of said Reservation;

**THENCE**, continuing along the north boundary of said Reservation and the south R.O.W. of said FM 2198,

N. 87°20'09" E., 1639.04 feet

to a standard USFWS aluminum monument marked "Mon. No. 4, LS 4971, 2004" set in the north boundary of said Reservation;

**THENCE**, continuing along the north boundary of said Reservation and the south R.O.W. of said FM 2198,

N. 83°10'09" E., 2514.57 feet

to the original existing concrete monument, said monument being described as Monument #5 in said 1943 survey;

**THENCE**, continuing along the north boundary of said Reservation and the south R.O.W. of said FM 2198,

N. 83°09'44" E., 873.38 feet

to an existing concrete monument for a corner of said Reservation, said monument being described as Monument #6 in said 1943 survey, said point also being the southwest corner of a 102 acre tract as conveyed to Charles L. O'Neil by Warranty Deed as recorded in Volume 700, Page 301, Deed Records, Harrison County, Texas, said 102 acre tract also being part of the same land as conveyed to O. H. Bland by deed recorded in Volume 339, Page 103, Deed Records, Harrison County, Texas;

**THENCE**, departing the original 1943 north boundary of said Reservation and the south R.O.W. of said FM 2198, along the south boundary of said 102 acre tract, said south boundary being shown on a survey plat dated March 25, 1960, as surveyed by Milard H. Hackney,

N. 83°09'22" E., 3584.05 feet

to a standard USFWS aluminum monument marked "Mon. No. 6-A, LS 4971, 2004" set for a corner of this tract and a corner of said 102 acre tract;

**THENCE**, continuing along the north boundary of said Reservation and the south boundary of said 102-acre tract as shown on said 1960 survey,

S. 34°50'38" E., 211.25 feet

to a standard USFWS aluminum monument marked "Mon. No. 6-B, LS 4971, 2004" set for a corner of this tract and a corner of said 102-acre tract;

**THENCE**, continuing along the north boundary of said Reservation and the south boundary of said 102-acre tract as shown on said 1960 survey,

N. 12°28'22" E., 138.33 feet

to a standard USFWS aluminum monument marked "Mon. No. 6-C, 2004" set for a corner of this tract and on the south line of the said 102-acre tract, said point being in the shoreline of Caddo Lake and on the contour elevation 169.27 based on the USC&GS datum as surveyed in March, 1943 by Milard H. Hackney;

**THENCE**, departing the south line of said 102-acre tract and along the boundary of said Reservation, the meanders of said shoreline, and said contour elevation 167.27 USC&GS datum, the following courses and distances:

S. 21°39'12" E., 343.37 feet, N. 61°14'48" E., 505.03 feet,  
 N. 81°25'48" E., 237.95 feet, N. 46°52'48" E., 194.91 feet,  
 S. 70°47'12" E., 307.94 feet, N. 52°36'48" E., 186.21 feet  
 S. 15°06'12" E., 122.40 feet, N. 89°21'48" E., 175.03 feet,  
 N. 65°51'48" E., 182.09 feet, S. 71°33'12" E., 194.88 feet,  
 N. 89°23'48" E., 398.05 feet, N. 07°36'48" E., 69.99 feet,  
 N. 78°52'48" E., 59.48 feet, S. 56°52'12" E., 131.88 feet,  
 S. 80°21'12" E., 295.05 feet, N. 78°09'48" E., 560.28 feet,  
 N. 00°24'12" W., 99.95 feet, S. 56°32'12" E., 240.48 feet,  
 S. 14°06'12" E., 168.47 feet, N. 87°24'48" E., 173.33 feet,  
 S. 66°48'12" E., 131.56 feet, S. 31°07'12" E., 214.13 feet,  
 S. 10°46'48" W., 244.60 feet, S. 04°35'12" E., 159.69 feet,  
 N. 67°55'48" E., 136.44 feet, N. 47°11'48" E., 420.15 feet,  
 N. 50°17'48" E., 191.19 feet, N. 32°11'48" E., 471.52 feet,  
 N. 40°53'48" E., 121.69 feet, S. 86°29'12" E., 269.78 feet,  
 N. 80°30'48" E., 235.59 feet, S. 06°01'12" E., 191.94 feet,  
 S. 06°33'48" W., 424.43 feet, S. 08°29'12" E., 269.92 feet,  
 S. 71°59'12" E., 143.15 feet, N. 08°12'12" W., 135.54 feet,  
 N. 14°21'48" E., 383.96 feet, S. 73°42'12" E., 293.29 feet,  
 S. 08°20'48" W., 184.01 feet, S. 31°35'12" E., 43.56 feet,  
 S. 81°26'12" E., 345.73 feet, S. 39°59'12" E., 93.74 feet,  
 S. 12°27'12" E., 166.26 feet, S. 58°26'12" E., 93.36 feet,  
 S. 81°46'12" E., 164.83 feet, S. 17°31'12" E., 417.72 feet,  
 S. 62°32'12" E., 245.67 feet, S. 29°52'48" W., 227.93 feet,  
 N. 73°44'12" W., 376.41 feet, S. 29°08'48" W., 319.82 feet,  
 N. 35°24'12" W., 346.84 feet, S. 84°24'48" W., 369.15 feet,  
 N. 79°39'12" W., 210.23 feet, S. 04°07'48" W., 261.34 feet,  
 S. 23°27'48" W., 949.62 feet, S. 04°26'48" W., 474.84 feet,  
 S. 13°09'12" E., 461.99 feet, S. 46°52'48" W., 363.12 feet,  
 N. 88°22'12" W., 94.03 feet, S. 03°39'48" W., 440.62 feet,  
 S. 63°33'48" W., 122.43 feet, S. 12°49'48" W., 131.05 feet,  
 S. 87°04'12" E., 183.85 feet, N. 52°15'48" E., 532.57 feet,



S. 28°17'12" E., 97.18 feet, S. 69°43'12" E., 291.17 feet,  
 S. 46°08'12" E., 121.91 feet, S. 52°15'12" E., 664.11 feet,  
 S. 62°39'12" E., 448.85 feet, S. 08°27'12" E., 69.51 feet,  
 S. 21°39'48" W., 240.42 feet, S. 51°59'48" W., 189.71 feet,  
 S. 35°42'48" W., 171.62 feet, S. 06°18'48" W., 375.66 feet,  
 S. 22°17'48" W., 62.08 feet, S. 14°53'12" E., 346.33 feet,  
 S. 79°19'48" W., 534.74 feet, N. 58°08'12" W., 722.23 feet,  
 N. 78°54'12" W., 334.62 feet, S. 38°12'48" W., 97.98 feet,  
 S. 02°37'12" E., 436.82 feet

to a point on the mouth of Harralson's Bayou;

**THENCE**, crossing the mouth of Harralson's Bayou and continuing along the meanders of said shoreline, the following courses and distances:

S. 35°43'12" E., 452.54 feet, S. 04°04'48" W., 152.66 feet,  
 S. 77°45'12" E., 205.40 feet, S. 54°15'12" E., 407.98 feet,  
 N. 52°11'48" E., 452.53 feet, S. 70°52'12" E., 118.95 feet,  
 S. 44°49'12" E., 116.63 feet, S. 85°35'12" E., 118.22 feet,  
 N. 62°23'48" E., 201.20 feet, S. 78°22'12" E., 184.47 feet,  
 N. 80°00'48" E., 220.00 feet, N. 52°52'48" E., 103.69 feet,  
 S. 60°02'12" E., 244.71 feet, N. 76°48'48" E., 132.87 feet,  
 N. 36°51'48" E., 181.40 feet, N. 09°02'12" W., 270.58 feet,  
 N. 53°09'12" W., 253.78 feet, N. 08°41'12" W., 399.40 feet,  
 S. 86°06'12" E., 311.61 feet, S. 07°56'12" E., 355.95 feet,  
 S. 76°07'12" E., 357.41 feet, S. 27°17'48" W., 235.68 feet,  
 S. 41°46'48" W., 312.20 feet, S. 00°19'48" W., 596.79 feet,  
 S. 29°06'12" E., 273.30 feet, N. 67°48'48" E., 36.25 feet

to an existing concrete monument for a corner of this tract, said monument being described as Monument #9 in said 1943 survey, said point also being the southwest corner of the E.W. Mahone tract of land as described in the 1943 survey;

**THENCE**, along the north line of the said Reservation, and the south boundary line of the E. W. Mahone tract of land,

N. 87°25'43" E., 1373.01 feet

to a standard USFWS aluminum monument marked "Mon. No.10, LS 4971, 2004" set for the east northeast corner of said Reservation, and being in the west line of the Long Point Road as existing in 1943;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 00°36'20" W., 930.09 feet

to a standard USFWS aluminum monument marked "Mon. No.11, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 09°29'53" W., 682.95 feet

to a standard USFWS aluminum monument marked "Mon. No.12, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 14°51'43" W., 899.00 feet

to a standard USFWS aluminum monument marked "Mon. No.13, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 07°10'01" W., 942.03 feet

to a standard USFWS aluminum monument marked "Mon. No.14, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 00°08'25" W., 1129.32 feet

to a standard USFWS aluminum monument marked "Mon. No.15, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 14°03'12" W., 624.70 feet

to a standard USFWS aluminum monument marked "Mon. No.16, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 05°25'19" W., 1494.49 feet

to a standard USFWS aluminum monument marked "Mon. No.17, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 05°08'03" E., 486.48 feet

to a standard USFWS aluminum monument marked "Mon. No.18, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 15°57'09" E., 477.93 feet

to a standard USFWS aluminum monument marked "Mon. No.19, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 02°01'09" W., 560.24 feet

to a standard USFWS aluminum monument marked "Mon. No.20, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 21°50'13" E., 819.83 feet

to a standard USFWS aluminum monument marked "Mon. No.21, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the east boundary line of said Reservation and the west line of said Long Point Road as described in said 1943 survey,

S. 01°41'57" W., 1194.14 feet

to a standard USFWS aluminum monument marked "Mon. No.22, LS 4971, 2004" set for the southeast corner of this tract and the southeast corner of said Reservation;

**THENCE**, along the south boundary line of said Reservation and departing the west line of said Long Point Road as described in said 1943 survey,

S. 87°04'07" W., 2766.15 feet

to a standard USFWS aluminum monument marked "Mon. No.23, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point also being the southwest corner of the J. W. Adams Survey and the southeast corner of Calvin Fuller Survey No. 250 as described in said 1943 survey;

**THENCE**, continuing along the south boundary line of said Reservation,

S. 87°04'07" W., 2644.88 feet

to a standard USFWS aluminum monument marked "Mon. No.24-A, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point also being the southwest corner of Calvin Fuller Survey No. 250 and the southeast corner of the Joe Lake, Jr. Survey as described in said 1943 survey, the original monument #24 was set 10.50 feet to the east along the boundary and the original monument #25 was set 8.92 feet to the west along the boundary;

**THENCE**, continuing along the south boundary line of said Reservation,

S. 87°04'07" W., 288.78 feet

to a standard USFWS aluminum monument marked "Mon. No.26-A, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point also being the southwest corner of Calvin Fuller Survey No. 250 and the southeast corner of the Joe Lake, Jr. Survey as described in said 1943 survey, the original monument #26 was west 33.33 feet;

**THENCE**, along the most southern east boundary line of said Reservation,

S. 02°54'29" E., 2573.05 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #27 in said 1943 survey, Monument No. 27 was set for a point adopted for the southeast corner of the J. B. Webster Survey and the northeast corner of the Joseph Killingworth Survey as described in said 1943 survey;

**THENCE**, along the south boundary line of said Reservation,

S. 87°32'50" W., 3730.60 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #28 in said 1943 survey, said point also being the southwest corner of the J. B. Webster Survey and the southeast corner of the H. Vogt Survey as described in said 1943 survey;



**THENCE**, continuing along the south boundary line of said Reservation,

S. 87°33'24" W., 638.79 feet

to a standard USFWS aluminum monument marked "Mon. No.28A, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point also being the southwest corner of the H. Vogt Survey and southeast corner of the W. Reynolds Survey as described in said 1943 survey;

**THENCE**, continuing along the south boundary line of said Reservation,

S. 87°33'24" W., 3690.56 feet

to a standard USFWS aluminum monument marked "Mon. No.29, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being the adopted position for the northwest corner of the L. D. Isam survey and the southwest corner of the W. Reynolds Survey as described in said 1943 survey;

**THENCE**, continuing along the south boundary line of said Reservation,

S. 87°33'24" W., 1389.52 feet

to a standard USFWS aluminum monument marked "Mon. No.30, LS 4971, 2004" set for the southwest corner of this tract and the southwest corner of the said Reservation, said point being in the northeast line of a 100-foot R.O.W., said R.O.W. being 50.00 feet each side of the centerline of the L. & A. Railroad (L.&A.R.R.);

**THENCE**, along the west boundary line of said Reservation and the northeast R.O.W. line of said L.&A.R.R.,

N. 29°46'42" W., 4596.62 feet

to a standard USFWS aluminum monument marked "Mon. No.31, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the northeast R.O.W. line of said L.&A.R.R.,

N. 29°46'42" W., 1816.85 feet

to a standard USFWS aluminum monument marked "Mon. No.32, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the northeast R.O.W. line of said L.&A.R.R.,

N. 29°47'24" W., 916.22 feet

to a standard USFWS aluminum monument marked "Mon. No.33, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the northeast R.O.W. line of said L.&A.R.R.,

N. 29°48'25" W., 2391.86 feet

to a standard USFWS aluminum monument marked "Mon. No.34, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being the point of curvature of curve to the left;

**THENCE**, continuing along the west boundary line of said Reservation, the northeast line of said 100-foot R.O.W., and the arc of said curve to the left, having a radius of 5779.00 feet, a chord bearing of N. 31°13'00" W., a chord distance of 285.91 feet, the arc distance of

285.93 feet

to a standard USFWS aluminum monument marked "Mon. No.35, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being at the re-entrant corner of a change in right-of-way width of the said L.&A.R.R.;

**THENCE**, departing said curve to the left, continuing along the west boundary line of said Reservation and said R.O.W.,

N. 57°21'58" E., 99.98

to a standard USFWS aluminum monument marked "Mon. No.36, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being 150 feet perpendicular to the centerline of said L.&A.R.R. through the town of Karnack, Texas, said point also being in a curve to the left;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the left, having a radius of 5878.98 feet, a chord bearing N. 34°37'19" W., a chord distance of 410.30 feet, an arc distance of

410.39 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #37 in said 1943 survey;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the left, having a radius of 5878.98 feet, a chord bearing N. 38°37'17" W., a chord distance of 410.26 feet, an arc distance of

410.34 feet

to a standard USFWS aluminum monument marked "Mon. No.38, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the left, having a radius of 5878.98 feet, a chord bearing of N. 42°37'14" W., a chord distance of 410.28 feet, an arc distance of

410.36 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #39 in said 1943 survey;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the left, having a radius of 5878.98 feet, a chord bearing of N. 46°37'11" W., a chord distance of 410.23 feet, an arc distance of

410.31 feet

to a standard USFWS aluminum monument marked "Mon. No.40, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the left, having a radius of 5878.98 feet, a chord bearing N. 50°08'29" W., a chord distance of 312.38 feet, an arc distance of

312.41 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #41 in said 1943 survey, said point being at the point of intersection of said curve to the left and a curve to the right;

**THENCE**, continuing along the west boundary line of said Reservation, said R.O.W., and the arc of said curve to the right, having a radius of 723.17 feet, a chord bearing S. 87°51'21" W., a chord distance of 127.80 feet, an arc distance of

127.96 feet

to a standard USFWS aluminum monument marked "Mon. No.42, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, departing said curve to the right, continuing along the west boundary line of said Reservation and said R.O.W.,

S. 37°25'41" W., 17.63 feet

to a standard USFWS aluminum monument marked "Mon. No.43, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being the northerly re-entrant corner of said L.&A.R.R. R.O.W. through Karnack, Texas, and a curve to the left, said point also being 50 feet perpendicular to the centerline of said L.&A.R.R.;

**THENCE**, continuing along the west boundary line of said Reservation, and along said R.O.W., and the arc of said curve to the left, having a radius of 5779.00 feet, a chord bearing of N. 54°05'49" W., a chord distance of 304.93 feet, an arc distance of

304.96 feet

to a standard USFWS aluminum monument marked "Mon. No.44, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being at the intersection of said R.O.W. and the east R.O.W. of the Karnack-Johnson's Ranch Road leading northward from Karnack;

**THENCE**, departing said curve to the left and said L.&A.R.R. R.O.W., along the west boundary line of said Reservation and the east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 33°34'49" W., 568.35 feet

to a standard USFWS aluminum monument marked "Mon. No.45, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 29°02'59" W., 303.22 feet

to a standard USFWS aluminum monument marked "Mon. No.46, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 31°09'19" W., 724.98 feet

to a standard USFWS aluminum monument marked "Mon. No.47, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 11°42'59" W., 564.53 feet



to a standard USFWS aluminum monument marked "Mon. No.48, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 09°05'49" W., 304.47 feet

to a standard USFWS aluminum monument marked "Mon. No.49, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 07°47'49" W., 213.28 feet

to a standard USFWS aluminum monument marked "Mon. No.50A, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being at the point of intersection of the east R.O.W. of the Karnack-Johnson's Ranch Road and the south line of the entrance road to the Oscar Hope Cemetery;

**THENCE**, departing the east R.O.W. of the Karnack-Johnson's Ranch Road, along the boundary line of said Reservation and the south line of the entrance road to said Oscar Hope Cemetery,

N. 89°39'07" E., 915.40 feet

to an existing concrete monument for a corner of this tract, a corner of said Reservation and a corner of said Oscar Hope Cemetery, said monument being described as Monument #51 in said 1943 survey;

**THENCE**, along the boundary line of said Reservation and west line of said cemetery,

S. 04°56'39" E., 225.17 feet

to a standard USFWS aluminum monument marked "Mon. No.52A, LS 4971, 2004" set for a corner of this tract, a corner of said Reservation and the southwest corner of said cemetery;

**THENCE**, along the boundary line of said Reservation and south line of said cemetery,

N. 86°08'57" E., 92.94 feet

to a standard USFWS aluminum monument marked "Mon. No.53A, LS 4971, 2004" set for a corner of this tract, a corner of said Reservation and the southeast corner of said cemetery;

**THENCE**, along the boundary line of said Reservation and east line of said cemetery,

N. 07°58'19" W., 275.53 feet

to an existing concrete monument for a corner of this tract, a corner of said Reservation, and the northeast corner of said cemetery, said monument being described as Monument #54 in said 1943 survey;

**THENCE**, along the boundary line of said Reservation and the north line of said entrance road,

S. 89°24'06" W., 996.71 feet

to a standard USFWS aluminum monument marked "Mon. No.55, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being at the point of intersection of the east R.O.W. of the Karnack-Johnson's Ranch Road and the north side of the entrance road to said cemetery;

**THENCE**, along the west boundary line of said Reservation and the east R.O.W. line of the Karnack-Johnson's Ranch Road,

N. 03°00'46" W., 447.98 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #56 in said 1943 survey, said point being at the point of intersection of the east R.O.W. line of said Karnack-Johnson's Ranch Road and the south line of the Karnack-Jefferson Road known as Texas Farm to Market Highway No. 2198 (FM 2198);

**THENCE**, along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 43°09'22" E., 720.26 feet

to a standard USFWS aluminum monument marked "Mon. No.57, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 49°44'42" E., 743.63 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #58 in said 1943 survey;

**THENCE**, along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 15°33'46" E., 301.23 feet

to a standard USFWS aluminum monument marked "Mon. No.59, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 15°03'17" E., 457.51 feet

to a standard USFWS aluminum monument marked "Mon. No.60, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 16°00'07" E., 607.36 feet

to a standard USFWS aluminum monument marked "Mon. No.61, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 21°54'17" E., 670.03 feet

to a standard USFWS aluminum monument marked "Mon. No.62, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 23°13'37" E., 338.47 feet

to a standard USFWS aluminum monument marked "Mon. No.63, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 24°13'47" E., 590.74 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #64 in said 1943 survey;

**THENCE**, continuing along the west boundary line of said Reservation and the east R.O.W. line of said FM 2198,

N. 18°28'17" E., 957.10 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #65 in said 1943 survey;

**THENCE**, continuing along the west boundary line of said Reservation,

N. 25°22'51" W., 553.19 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #66 in said 1943 survey;

**THENCE**, continuing along the west boundary line of said Reservation,

N. 25°17'01" W., 286.64 feet

to a standard USFWS aluminum monument marked "Mon. No.67, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation,

N. 00°39'46" W., 186.95 feet

to a standard USFWS aluminum monument marked "Mon. No.68, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation, at 122.80 feet, the centerline of said FM 2198, and in all

N. 28°37'36" W., 743.90 feet

to a standard USFWS aluminum monument marked "Mon. No.69, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation, said point being in the east R.O.W. of the Karnack-Pine Island Road;

**THENCE**, along the west boundary line of said Reservation and the east line of the old Karnack-Pine Island Road,

N. 06°31'46" W., 561.55 feet

to a standard USFWS aluminum monument marked "Mon. No.70, LS 4971, 2004" for a corner of this tract and a corner of said Reservation;



**THENCE**, continuing along the west boundary line of said Reservation and the east line of the old Karnack-Pine Island Road,

N. 13°11'26" W., 334.57

to a standard USFWS aluminum monument marked "Mon. No.71, LS 4971, 2004" for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the west boundary line of said Reservation and the east line of the old Karnack-Pine Island Road,

N. 22°40'06" W., 326.00 feet

to a standard USFWS aluminum monument marked "Mon. No.71A, LS 4971, 2004" set over the top of an existing angle iron for the northwest corner of this tract and a corner of said Reservation, said point being at the end of an existing fence of said Reservation;

**THENCE**, along the north boundary line of said Reservation and with said fence,

S. 84°29'13" E., 199.53 feet

to a standard USFWS aluminum monument marked "Mon. No.71B, LS 4971, 2004" set over the top of an existing 1 ¼ inch pipe for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the north boundary line of said Reservation and said fence,

S. 25°25'21" W., 104.80 feet

to a standard USFWS aluminum monument marked "Mon. No.71C, LS 4971, 2004" set over the top of an existing 1 ¼ inch pipe for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the north boundary line of said Reservation and said fence,

S. 87°34'46" E., 581.03 feet

to a standard USFWS aluminum monument marked "Mon. No.73, LS 4971, 2004" set over the top of an existing 5/8 inch iron pin for a corner of this tract and a corner of said Reservation, said point being the northwest corner of a 113.51-acre tract of land formerly known as C-54 purchased from B.W. Wadlington, and the northeast corner of a tract of land formerly a portion of the Caddo State Park (B-49);

**THENCE**, along the north boundary line of said Reservation and along the line between the former State Park land and the B.W. Wadlington land, at 940.10 feet, the centerline of said FM 2198, and in all

S. 35°30'33" E., 1031.35 feet

to a standard USFWS aluminum monument marked "Mon. No.74, LS 4971, 2004" for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the north boundary line of said Reservation,

N. 59°58'33" E., 672.20 feet

to the **POINT OF BEGINNING**, and containing 8,406.74 acres, more or less, and subject to all highway and road R.O.W. easements of record, and **LESS AND EXCEPT** the following described tract:

### **Public Cemetery**

That certain tract of land referred to as a Public Cemetery described as an exception in the deed from J.T. Taylor and wife to the United States of America, recorded in Volume 249, Page 415, Deed Records, Harrison County, Texas, said tract being described by metes and bounds as follows:

**BEGINNING** at an existing fence corner for the northwest corner of this tract and the northwest corner of said Public Cemetery, said point having a coordinate value of N=6962238.768, E=3302326.302;

**THENCE**, along the north boundary line,

N. 62°04'20" E., 245.00 feet

to a point for the northeast corner of this tract and the northeast corner of said Public Cemetery;

**THENCE**, along the east boundary line,

S. 27°55'40" E., 220.00 feet

to a point for the southeast corner of this tract and the southeast corner of said Public Cemetery;

**THENCE**, along the south boundary line,

S. 62°04'20" W., 245.00 feet

to a point for the southwest corner of this tract and the southwest corner of said Public Cemetery;

**THENCE**, along the west boundary line,

N. 27°55'40" W., 220.00 feet

to the **POINT OF BEGINNING**, and containing 1.24 acres, more or less.

and **LESS AND EXCEPT** the following described government parcels:

**Parcel No. 1 - Production Area**

**BEGINNING** at a standard USFWS aluminum monument marked "Mon. PA 1, LS 4971, 2004" set for a corner of this tract, said point being in the north line of said Reservation and in the south R.O.W. of said FM 2198, said point having a coordinate value of N=6964047.231, E=3304536.408, and bears N. 87°20'09" E., 385.55 feet from a standard USFWS aluminum monument marked "Mon. No. 3, LS 4971, 2004" set for a corner of said tract (100a) and a corner of said Reservation;

**THENCE**, along the boundary line of said Parcel No. 1,

S. 10°45'16" E., 712.77 feet

to a standard USFWS aluminum monument marked "Mon. PA 2, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 45°03'59" W., 1112.35 feet

to a standard USFWS aluminum monument marked "Mon. PA 3, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 18°39'51" W., 87.90 feet

to a standard USFWS aluminum monument marked "Mon. PA 4, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 03°23'53" E., 346.51 feet

to a standard USFWS aluminum monument marked "Mon. PA 5, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 47°53'58" E., 166.74 feet

to a standard USFWS aluminum monument marked "Mon. PA 6, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 45°44'32" W., 262.87 feet

to an existing Corps of Engineers monument marked "X-21, 1987" and known as "PA 7", for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 42°26'11" W., 345.96 feet

to a standard USFWS aluminum monument marked "Mon. PA 8, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 42°56'56" E., 678.66 feet

to a standard USFWS aluminum monument marked "Mon. PA 9, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 56°27'23" W., 118.78 feet

to a standard USFWS aluminum monument marked "Mon. PA 10, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 00°10'19" W., 785.31 feet

to a standard USFWS aluminum monument marked "Mon. PA 11, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 44°27'06" E., 1174.31 feet

to a standard USFWS aluminum monument marked "Mon. PA 12, LS 4971, 2004" set for a corner of this tract, said point being a common corner with the West FIA, described as Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,



N. 44°05'56" E., 148.29 feet

to a standard USFWS aluminum monument marked "Mon. PA 13, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 45°54'04" E., 290.33 feet

to a standard USFWS aluminum monument marked "Mon. PA 14, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 30°47'33" E., 313.37 feet

to a standard USFWS aluminum monument marked "Mon. PA 15, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 19°31'45" W., 256.78 feet

to a standard USFWS aluminum monument marked "Mon. PA 16, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 44°49'03" W., 2814.22 feet

to a standard USFWS aluminum monument marked "Mon. PA 17, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 10°14'34" E., 93.86 feet

to a standard USFWS aluminum monument marked "Mon. PA 18, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 47°41'22" E., 385.18 feet

to a standard USFWS aluminum monument marked "Mon. PA 19, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

N. 45°10'34" E., 2434.87 feet

to a standard USFWS aluminum monument marked "Mon. PA 20, LS 4971, 2004" set for a corner of this tract, a corner of said Parcel No. 3, and a corner of the Fire House Area, described as Parcel No. 2, said point having a coordinate value of N=6958157.362, E=3305190.994;

**THENCE**, continuing along the boundary line of said Parcel No. 1, and along the boundary line of said Parcel No. 2,

N. 45°10'34" E., 1281.24 feet

to a standard USFWS aluminum monument marked "Mon. PA 21, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 2,

N. 65°59'08" E., 234.42 feet

to a standard USFWS aluminum monument marked "Mon. PA 22 LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 2,

S. 26°57'40" E., 198.71 feet

to a standard USFWS aluminum monument marked "Mon. PA 23 LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 2,

S. 53°22'58" W., 332.62 feet

to a standard USFWS aluminum monument marked "Mon. PA 24, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 2,

N. 41°35'25" W., 185.01 feet

to a standard USFWS aluminum monument marked "Mon. PA 25, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 2,

S. 44°57'09" W., 1120.27 feet

to a standard USFWS aluminum monument marked "Mon. PA 26, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 2, said point being in an east boundary line of said Parcel No. 3;

**THENCE**, with and along the exception boundary,

S. 45°19'19" E., 1721.97 feet

to a standard USFWS aluminum monument marked "Mon. PA 27, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 44°36'29" W., 1902.37 feet

to a standard USFWS aluminum monument marked "Mon. PA 28, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 3,

S. 45°34'11" W., 1360.23 feet

to a standard USFWS aluminum monument marked "Mon. PA 29, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 3;

**THENCE**, departing the common boundary line between said Parcel No. 1 and said Parcel No. 3, along the boundary line of said Parcel No. 1,

S. 44°59'28" E., 1702.12 feet

to a standard USFWS aluminum monument marked "Mon. PA 30, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 44°54'53" E., 1160.29 feet

to a standard USFWS aluminum monument marked "Mon. PA 31, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 44°48'30" E., 3316.84 feet

to a standard USFWS aluminum monument marked "Mon. PA 32, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 61°14'03" E., 160.43 feet

to a standard USFWS aluminum monument marked "Mon. PA 33, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 81°18'21" E., 150.98 feet

to a standard USFWS aluminum monument marked "Mon. PA 34, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 67°20'04" E., 412.26 feet

to a standard USFWS aluminum monument marked "Mon. PA 35, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 82°02'32" E., 673.19 feet

to a standard USFWS aluminum monument marked "Mon. PA 36, LS 4971, 2004" set for a corner of this tract;



**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 88°44'26" E., 821.06 feet

to a standard USFWS aluminum monument marked "Mon. PA 37, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 80°42'25" E., 444.51 feet

to a standard USFWS aluminum monument marked "Mon. PA 38, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 73°49'30" E., 733.93 feet

to a standard USFWS aluminum monument marked "Mon. PA 39, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 14°57'09" E., 440.58 feet

to a standard USFWS aluminum monument marked "Mon. PA 40, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 76°06'19" E., 228.13 feet

to a standard USFWS aluminum monument marked "Mon. PA 41, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 14°06'34" W., 449.85 feet

to a standard USFWS aluminum monument marked "Mon. PA 42, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 60°16'24" E., 108.23 feet

to a standard USFWS aluminum monument marked "Mon. PA 43, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 48°27'30" E., 552.61 feet

to a standard USFWS aluminum monument marked "Mon. PA 44, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 39°31'14" E., 825.88 feet

to a standard USFWS aluminum monument marked "Mon. PA 45, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

S. 88°02'33" W., 1148.20 feet

to a standard USFWS aluminum monument marked "Mon. PA 46, LS 4971, 2004" set for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 1,

N. 74°48'22" W., 642.16 feet

to a standard USFWS aluminum monument marked "Mon. PA 47, LS 4971, 2004" set for a corner of this tract and a corner of the East FIA, described as Parcel No. 4;

**THENCE**, continuing along the boundary line of said Parcel No. 1 and along a boundary line of said Parcel No. 4,

N. 21°52'47" W., 5555.38 feet

to a standard USFWS aluminum monument marked "Mon. PA 48, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 4;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 4,

N. 35°05'17" W., 362.98 feet

to a standard USFWS aluminum monument marked "Mon. PA 49, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 4;

**THENCE**, continuing along the common boundary line between said Parcel No. 1 and said Parcel No. 4,

N. 48°26'21" W., 746.04 feet

to a standard USFWS aluminum monument marked "Mon. PA 50, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 4, said point being in the north boundary line of said Reservation and in the south R.O.W. line of said FM 2198;

**THENCE**, along the common boundary line between said Parcel No. 1, said Reservation and the south R.O.W. line of said FM 2198,

S. 83°09'44" W., 171.59 feet

to the original existing concrete monument, for a corner of this tract and a corner of said Reservation, said monument being described as Monument #5 in the said 1943 survey;

**THENCE**, continuing along the common boundary line between said Parcel No.1, said Reservation and the south R.O.W. line of said FM 2198,

S. 83°10'09" W., 2514.57 feet

to a standard USFWS aluminum monument marked "Mon. 4, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along the common boundary line between said Parcel No. 1, said Reservation and the south R.O.W. of said FM 2198,

S. 87°20'09" W., 1253.49 feet

to the **POINT OF BEGINNING**, and containing 1,188.88 acres, more or less.

#### **Parcel No. 2 – Fire House Area**

**BEGINNING** at a standard USFWS aluminum monument marked "Mon. PA No.20, LS 4971, 2004" set for a corner of this tract, a corner of the Production Area, described as Parcel No. 1, and a corner of the West FIA, described as Parcel No. 3, said point having a coordinate value of N=6958157.362, E=3305190.994;

**THENCE**, along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

N. 45°10'34" E., 1281.21 feet

to a standard USFWS aluminum monument marked "Mon. PA 21, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

N. 65°59'08" E., 234.42 feet

to a standard USFWS aluminum monument marked "Mon. PA 22, LS 4971, 2004" set for a corner of this tract and said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

S. 26°57'40" E., 198.71 feet

to a standard USFWS aluminum monument marked "Mon. PA 23, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

S. 53°22'58" W., 332.62 feet

to a standard USFWS aluminum monument marked "Mon. PA 24, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

N. 41°35'25" W., 185.01 feet

to a standard USFWS aluminum monument marked "Mon. PA 25, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 2 and said Parcel No. 1,

S. 44°57'09" W., 1120.27 feet

to a standard USFWS aluminum monument marked "Mon. PA 26, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1, said point being in an east boundary line of said Parcel No. 3;

**THENCE**, along the common boundary line between said Parcel No. 2 and said Parcel No. 3,



N. 45°19'19" W., 44.59 feet

to the **POINT OF BEGINNING**, and containing 2.98 acres, more or less.

**Parcel No. 3 - West FIA**

**BEGINNING** at a standard United States Fish and Wildlife Service (USFWS) aluminum monument marked "Mon. PA No. 12, LS 4971, 2004" set for a corner of this tract and a corner of the Production Area, described as Parcel No. 1, said point having a coordinate value of N=6959395.632, E=3304759.792;

**THENCE**, along the common boundary line between said Parcel No 3 and said Parcel No. 1,

N. 44°05'56" E., 148.29 feet

to a standard USFWS aluminum monument marked "Mon. PA 13, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 45°54'04" E., 290.33 feet

to a standard USFWS aluminum monument marked "Mon. PA 14, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 30°47'33" E., 313.37 feet

to a standard USFWS aluminum monument marked "Mon. PA 15, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 19°31'45" W., 256.78 feet

to a standard USFWS aluminum monument marked "Mon. PA 16, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, with and along the exception boundary,

S. 44°49'03" W., 2814.22 feet

to a standard USFWS aluminum monument marked "Mon. PA 17, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 10°14'34" E., 93.86 feet

to a standard USFWS aluminum monument marked "Mon. PA 18, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 47°41'22" E., 385.18 feet

to a standard USFWS aluminum monument marked "Mon. PA 19, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

N. 45°10'34" E., 2434.87 feet

to a standard USFWS aluminum monument marked "Mon. PA 20, LS 4971, 2004" set for a corner of this tract, a corner of said Parcel No. 1, and the Fire House Area, described as Parcel 2;

**THENCE**, along the common boundary line between said Parcel No 3 and said Parcel No. 2, and along a boundary line of said Parcel No. 1, at 44.59 feet a standard USFWS aluminum monument marked "Mon. PA 26, LS 4971, 2004" set for a corner of said Parcel No. 1, and in all

S. 45°19'19" E., 1766.56 feet

to a standard USFWS aluminum monument marked "Mon. PA 27, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 44°36'29" W., 1902.37 feet

to a standard USFWS aluminum monument marked "Mon. PA 28, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 3 and said Parcel No. 1,

S. 45°34'11" W., 1360.23 feet

to a standard USFWS aluminum monument marked "Mon. PA 29, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, departing the boundary line of said Parcel No. 1, along the boundary line of said Parcel No. 3,

S. 43°13'52" W., 504.35 feet

to a point for the most southern southwest corner of this tract;

**THENCE**, along the boundary line of said Parcel No. 3,

N. 42°33'57" W., 1266.27 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

N. 62°55'57" W., 1008.98 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

S. 44°13'28" W., 464.20 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

N. 46°36'29" W., 1249.43 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

N. 26°09'05" E., 1670.68 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

S. 73°12'19" E., 1144.34 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

N.45°09'57"E., 2040.92 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 3,

N. 46°55'48" E., 921.12 feet

to the **POINT OF BEGINNING**, and containing 290.16 acres, more or less.

**Parcel No. 4 - East FIA**

**BEGINNING** at an existing concrete monument, said monument being described as Monument #6 in said 1943 survey, said point also being the southwest corner of a 102-acre tract as conveyed to Charles L. O'Neil by Warranty Deed as recorded in Volume 700, Page 301, Deed Records, Harrison County, Texas, said 102 acre tract also being part of the same land as conveyed to O. H. Bland by deed recorded in Volume 339, Page 103, Deed Records, Harrison County, Texas, said point having a coordinate value of N=6964508.562, E=3309152.441;

**THENCE**, along the north boundary of said Reservation and the south boundary of said 102 acre tract, said south boundary being shown on a survey plat dated March 25, 1960, as surveyed by Milard H. Hackney,

N. 83°09'22" E., 3341.62 feet

to a point for a corner of this tract;

**THENCE**, departing the north boundary of said Reservation and the south boundary of said 102-acre tract, along the boundary line of said Parcel No. 4,

S. 10°33'55" E., 3712.62 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 4,

S. 36°27'34" W., 2614.88 feet

to a point for a corner of this tract;

**THENCE**, continuing along the boundary line of said Parcel No. 4,



S. 24°13'44" W., 741.46 feet

to a standard USFWS aluminum monument marked "Mon. PA 47, LS 4971, 2004" set for a corner of this tract and a corner of the Production Area, described as Parcel No. 1;

**THENCE**, along the common boundary line between said Parcel No. 4, and said Parcel No. 1,

N. 21°52'47" W., 5555.38 feet

to a standard USFWS aluminum monument marked "Mon. PA 48, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 4 and said Parcel No. 1,

N. 35°05'17" W., 362.98 feet

to a standard USFWS aluminum monument marked "Mon. PA 49, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1;

**THENCE**, continuing along the common boundary line between said Parcel No. 4 and said Parcel No. 1,

N. 48°26'21" W., 746.04 feet

to a standard USFWS aluminum monument marked "Mon. PA 50, LS 4971, 2004" set for a corner of this tract and a corner of said Parcel No. 1, said point being in the north boundary line of said Reservation and in the south R.O.W. line of said FM 2198;

**THENCE**, along the north boundary line of said Reservation and the south R.O.W. line of said FM 2198,

N. 83°09'44" E., 701.80 feet

to the **POINT OF BEGINNING**, and containing 357.39 acres, more or less.

#### **Parcel No. 5 -Y Area**

**BEGINNING** at the northwest corner of the Y Area, described as Parcel No. 5, said point being described as "Y Area Point No. 1" and having a coordinate value of N=6959129.000, E=3313944.000;

**THENCE**, along the boundary line of said Parcel No. 5,

S. 37°20'50" E., 276.11 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 2";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

S. 50°02'10" W., 92.64 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 3";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

S. 37°35'55" E., 370.83 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 4";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

N. 53°26'46" E., 320.65 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 5";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

S. 36°33'14" E., 240.14 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 6";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

N. 53°26'46" E., 418.97 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 7";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

N. 36°33'14" W., 238.05 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 8";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

N. 46°40'52" E., 314.31 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 9";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

N. 40°04'25" W., 625.43 feet

to a point for a corner of this tract, said point being described as "Y Area Point No. 10";

**THENCE**, continuing along the boundary line of said Parcel No. 5,

S. 53°01'35" W., 931.48 feet

to the **POINT OF BEGINNING**, and containing 17.24 acres, more or less.

**Parcel No. 6 - Static Test Area**

**BEGINNING** at the southwest corner of the Static Test Area, described as Parcel No. 6, said point being described as "Static Test Area Point No. 1" and having a coordinate value of N=6956475.567, E=3314970.000;

**THENCE**, along the boundary line of said Parcel No. 6,

N. 08°28'34" W., 364.20 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 2";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N. 05°20'02" E., 339.38 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 3";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N. 27°35'38" E., 529.07 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 4";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N. 54°26'04" W., 558.95 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 5";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N. 35°33'56" E., 320.99 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 6";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S.  $54^{\circ}26'04''$  E., 662.42 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 7";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S.  $03^{\circ}13'15''$  E., 277.80 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 8";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $86^{\circ}46'45''$  E., 470.50 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 9";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $38^{\circ}54'48''$  E., 353.96 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 10";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $82^{\circ}39'01''$  E., 276.46 feet

to a point for a corner of this tract, said point being described "Static Test Area Point No. 11";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $11^{\circ}01'16''$  E., 289.56 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 12";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $34^{\circ}29'08''$  W., 273.89 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 13";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N.  $55^{\circ}30'52''$  E., 344.36 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 14";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S. 34°29'08" E., 436.55 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 15";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S. 25°11'41" W., 851.50 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 16";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S. 56°18'36" W., 832.88 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 17";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S. 26°17'12" W., 632.46 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 18";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

S. 58°35'39" W., 112.41 feet

to a point for a corner of this tract, said point being described as "Static Test Area Point No. 19";

**THENCE**, continuing along the boundary line of said Parcel No. 6,

N. 79°50'24" W., 483.04 feet

to the **POINT OF BEGINNING**, and containing 40.38 acres, more or less.

**Parcel No. 7 - Landfill 12 Area**

**BEGINNING** at the southwest corner of the Landfill 12 Area, described as Parcel No. 7, said point being described as "Landfill 12 Area Point No. 1" and having a coordinate value of N=6953300.238, E=3311087.540;

**THENCE**, along the boundary line of said Parcel No. 7,



N. 03°15'36" W., 1741.41 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 2";

**THENCE**, along the boundary line of said Parcel No. 7,

N. 62°03'32" E., 1151.75 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 3";

**THENCE**, along the boundary line of said Parcel No. 7,

S. 15°55'59" E., 1311.85 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 4";

**THENCE**, along the boundary line of said Parcel No. 7,

S. 35°09'33" W., 1306.48 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 5";

**THENCE**, along the boundary line of said Parcel No. 7,

N. 84°25'54" W., 528.74 feet

to the **POINT OF BEGINNING**, and containing 50.54 acres, more or less.

**Parcel No. 8 – Burning Ground Area**

**BEGINNING** at the southwest corner of the Burning Ground Area, described as Parcel No. 8, said point being described as "Burning Ground Area Point No. 1" and having a coordinate value of N=6952663.146, E=3312999.681;

**THENCE**, along the boundary line of said Parcel No. 8,

N. 06°33'56" W., 583.86 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 2";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 50°07'04" E., 945.26 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 3";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 64°34'54" E., 736.30 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 4";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 88°44'44" E., 812.78 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 5";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 12°07'30" E., 591.32 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 6";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 26°06'36" E., 1436.99 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 7";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 89°15'47" E., 622.05 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 8";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 14°25'19" E., 378.42 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 9";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 89°57'36" E., 644.72 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 10";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 06°45'05" E., 712.03 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 11";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 33°39'26" E., 906.27 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 12";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 51°21'03" E., 1574.06 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 13";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 14°45'04" W., 3988.38 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 14";

**THENCE**, continuing along the boundary line of said Parcel No. 8, at 944.29 feet to a corner of the Demolition Debris Area, described as Parcel No. 9, said corner being described as "Demolition Debris Landfill Point No. 2", and in all

S. 87°04'01" W., 1901.94 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 15" and "Demolition Debris Landfill Point No. 1";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

S. 54°25'31" W., 495.73 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 16";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 70°22'47" W., 2032.70 feet

to a point for a corner of this tract, said point being described as "Burning Ground Area Point No. 17";

**THENCE**, continuing along the boundary line of said Parcel No. 8,

N. 84°00'15" W., 840.82 feet

to the **POINT OF BEGINNING**, and containing 379.94 acres, more or less.

**Parcel No. 9 - Demolition Debris Landfill Area**

**BEGINNING** at a point for the northwest corner of the Demolition Debris Landfill Area, described as Parcel No. 9, and a corner of the Burning Ground Area, described as Parcel No. 8, said point being described as "Demolition Debris Landfill Point No. 1" and "Burning Ground Area Point No. 12" and having a coordinate value of N=6952181.165, E=3316153.787;

**THENCE**, along the common boundary line between said Parcel No. 9 and said Parcel No. 8,

N. 87°04'01" E., 957.65 feet

to a point for a corner of this tract, said point being described as "Demolition Debris Landfill Point No. 2";

**THENCE**, departing the boundary line of said Parcel No. 8, and continuing along the boundary line of said Parcel No. 9,

S. 14°18'47" W., 884.94 feet

to a point in an arc of a curve to the left for a corner of this tract, said point being described as "Demolition Debris Landfill Point No. 3", said point also being in the boundary line of the Ground Signal Test Area, described as Parcel No. 10;

**THENCE**, along the common boundary line between said Parcel No. 9 and said Parcel No. 10, and along the arc of said curve to the left, having a radius of 1050.00 feet, a chord bearing of S.74°38'32" W., a chord distance 340.54 feet, and the arc distance of

342.05 feet

to a point in the arc of said curve to the left and in the boundary line of said Parcel No. 10 for a corner of this tract, said point being described as "Demolition Debris Landfill Point No. 4";

**THENCE**, departing the boundary line of said Parcel No. 10 and the arc of said curve to the left, and continuing along the boundary line of said Parcel No. 9,

N. 24°29'03" W., 987.46 feet

to the **POINT OF BEGINNING**, and containing 13.03 acres, more or less.

**Parcel No. 10 - Ground Signal Test Area**

**Commencing** at the center of the circular Ground Signal Test Area, described as Parcel No. 10, said center of the circle being described as "Ground Signal Test Area, Parcel No. 10" and having a coordinate value of N=6950328.496, E=3317001.631;

**THENCE**, along the radius of said circle,

N. 00°00'00" W., 1050.00 feet

to the **POINT OF BEGINNING**, said point being in the boundary of said Parcel No. 10, said point being described as "Ground Signal test Area Point 1";

**THENCE**, along the boundary line of said Parcel No. 10 and along the arc of said circle having a radius of 1050.00 feet, the arc distance of

6,597.34 feet

to the **POINT OF BEGINNING**, and containing 79.53 acres, more or less.

**Parcel No. 11 - Pistol Range Area**

**BEGINNING** at the southwest corner of the Pistol Range Area, described as Parcel No. 8, said point being described as "Pistol Range Area Point No. 1" and having a coordinate value of N=6951829.118, E=3314486.760;

**THENCE**, along the boundary line of said Parcel No. 11,

N. 00°07'22" E., 120.00 feet

to a point for a corner of this tract, said point being described as "Pistol Range Area Point No. 2";

**THENCE**, continuing along the boundary line of said Parcel No. 11,

S. 89°52'38" E., 400.00 feet



to a point for a corner of this tract, said point being described as "Pistol Range Area Point No. 3";

**THENCE**, continuing along the boundary line of said Parcel No. 11,

S. 00°07'22" W., 120.00 feet

to a point for a corner of this tract, said point being described as "Pistol Range Area Point No. 4";

**THENCE**, continuing along the boundary line of said Parcel No. 11,

N. 89°52'38" W., 400.00 feet

to the **POINT OF BEGINNING**, and containing 1.10 acres, more or less.

**Parcel No. 12 - South Test/Bomb Test Area**

**Commencing** at the center of the circular South Test/Bomb Test Area, described as Parcel No. 12, said center of the circle being described as "South Test/Bomb Test Area, Parcel No. 12" and having a coordinate value of N=6947078.977, E=3312606.948;

**THENCE**, along the radius of said circle,

N. 00°00'00" W., 1000.00 feet

to the **POINT OF BEGINNING**, said point being in the boundary of said Parcel No. 12, said point being described as "South Test/Bomb Test Area Point No. 1";

**THENCE**, along the boundary line of said Parcel No. 12 and along the arc of said circle having a radius of 1000.00 feet, the arc distance of

6,283.19 feet

to the **POINT OF BEGINNING**, and containing 72.14 acres, more or less.

**Parcel No. 13 - Perchlorate Area**

**BEGINNING** at the southwest corner of the Perchlorate Area, described as Parcel No. 13, said point being in south line of the said Reservation and described as "Perchlorate Area Point No. 1", said point having a coordinate value of N=6943901.781, E=3308079.059 and bears N. 87°33'24" E., 215.33 feet from a standard USFWS aluminum monument marked "Mon. No. 29, LS 4971, 2004" set for a corner of said tract (100a) and a corner of said Reservation;

**THENCE**, departing the south boundary line of said Reservation, along the boundary line of said Parcel No. 13,

N. 07°43'57" E., 1415.74 feet

to a point for a corner of this tract, said point being described as "Perchlorate Area Point No. 2";

**THENCE**, continuing along the boundary line of said Parcel No. 13,

N. 60°35'45" E., 1257.17 feet

to a point for a corner of this tract, said point being described as "Perchlorate Area Point No. 3";

**THENCE**, continuing along the boundary line of said Parcel No. 13,

N. 29°58'36" E., 618.44 feet

to a point for a corner of this tract, said point being described as "Perchlorate Area Point No. 4";

**THENCE**, continuing along the boundary line of said Parcel No. 13,

S. 89°16'09" E., 1104.07 feet

to a point for a corner of this tract, said point being described as "Perchlorate Area Point No. 5";

**THENCE**, continuing along the boundary line of said Parcel No. 13,

S. 01°46'59" E., 2424.53 feet

to a point for a corner of this tract in the south line of said Reservation, said point being described as "Perchlorate Area Point No. 6";

**THENCE**, along the boundary line of said Parcel No. 13 and the south boundary line of said Reservation,

S. 87°33'24" W., 2776.66 feet

to the **POINT OF BEGINNING**, and containing 125.48 acres, more or less.

#### **Parcel No. 14 – Excluded Area**

**BEGINNING** at a the northwest corner of the excluded area and the intersection of the north boundary line of the said Reservation and a fence, said point having a coordinate value of N=6957134.833, E=3320659.296 and bears N. 87°25'43" E., 211.20 feet from an existing concrete monument being described as Monument #9 in said 1943 survey, said point also being the southwest corner of the E.W. Mahone tract of land as described in the 1943 survey;

**THENCE**, along the said fence line,

S. 27°36'56" E., 158.12

to a point for angle in said fence;

**THENCE**, along the said fence line,

S. 86°04'47" E., 1087.07 feet

to a point in the east boundary line of said Reservation and the west line of the Long Point Road;

**THENCE**, along the east boundary line of said Reservation and the said west line of the Long Point Road,

N. 00°36'20" E., 266.56 feet

to a standard USFWS aluminum monument marked "Mon. No.10, LS 4971, 2004" set for the east northeast corner of this tract and a corner of said Reservation;

**THENCE**, along the north boundary line of said Reservation and the south boundary line of said E. W. Mahone tract of land,

S. 87°25'43" W., 1161.81 feet

to the **POINT OF BEGINNING**, and containing 5.23 acres, more or less.

**Parcel No. 15 – Warehouse Area**

**BEGINNING** at the southwest corner of the Warehouse Area, described as Parcel 15, said point being described as "Warehouse Area Point No. 1" and having a coordinate value of N=6962312.662, E=3313840.490;

**THENCE**, along the southwest boundary line of said Parcel No. 15,

N. 22°16'01" W., 410.00 feet

to a point for a corner of this tract, said point being described as "Warehouse Area Point No. 2";

**THENCE**, along the northwest boundary line of said Parcel No. 15,

N. 67°43'59" E., 1830.00 feet

to a point for a corner of this tract, said point being described as "Warehouse Area Point No. 3";

**THENCE**, continuing along the northeast boundary line of said Parcel No. 15,

S.  $22^{\circ}16'01''$  E., 410.00 feet

to a point for a corner of this tract, said point being described as "Warehouse Area Point No. 4";

**THENCE**, along the southeast boundary line of said Parcel No. 15,

S.  $67^{\circ}43'59''$  W., 1830.00 feet

to the **POINT OF BEGINNING**, and containing 17.22 acres, more or less.

**Parcel No. 16 –Magazine Area**

**BEGINNING** at the northwest corner of the Magazine Area, described as Parcel 16, said point being described as "Magazine Area Point No. 1" and having a coordinate value of N=6953367.274, E=3305376.322;

**THENCE**, along the north boundary line of said Parcel No. 16,

N.  $44^{\circ}54'53''$  E., 1163.59 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 2";

**THENCE**, continuing along the north boundary line of said Parcel No. 16,

N.  $44^{\circ}48'30''$  E., 3102.88 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 3";

**THENCE**, continuing along the north boundary line of said Parcel No. 16,

S.  $88^{\circ}51'19''$  E., 130.11 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 4";

**THENCE**, along the east boundary line of said Parcel No. 16,

S.  $22^{\circ}09'35''$  E., 1773.85 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 5";

**THENCE**, continuing along the east boundary line of said Parcel No. 16,

S.  $32^{\circ}53'44''$  E., 1892.28 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 6";

**THENCE**, continuing along the east boundary line of said Parcel No. 16,

S.  $32^{\circ}45'43''$  E., 4003.23 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 7";

**THENCE**, along the south boundary line of said Parcel No. 16,

S.  $01^{\circ}32'21''$  W., 87.17 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 8";

**THENCE**, continuing along the south boundary line of said Parcel No. 16,

S.  $27^{\circ}21'29''$  W., 97.18 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 9";

**THENCE**, continuing along the south boundary line of said Parcel No. 16,

S.  $44^{\circ}50'09''$  W., 3230.93 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 10";

**THENCE**, continuing along the south boundary line of said Parcel No. 16,

S.  $27^{\circ}00'37''$  W., 949.25 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 11";

**THENCE**, continuing along the south boundary line of said Parcel No. 16,

S.  $84^{\circ}33'53''$  W., 30.79 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 12";



**THENCE**, along the west boundary line of said Parcel No. 16,

N. 32°41'21" W., 6357.37 feet

to a point for a corner of this tract, said point being described as "Magazine Area Point No. 13";

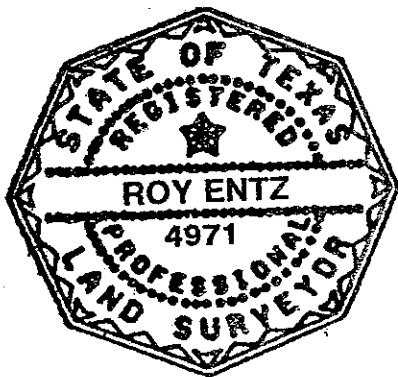
**THENCE**, continuing along the west boundary line of said Parcel No. 16,

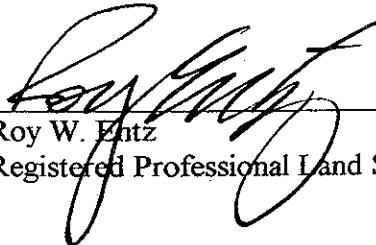
N. 26°55'32" W., 1725.11 feet

to the **POINT OF BEGINNING**, and containing 741.69 acres, more or less.

The hereinbefore-described tract of land, less the hereinbefore-described exceptions, contains 5022.57 acres, more or less, and is delineated on a plat designated "United States of America Tract (100a,b)" bearing the date of May, 2004, of record in the files of the United States Department of the Interior, Fish and Wildlife Service.

May, 2004



  
Roy W. Entz

Registered Professional Land Surveyor #4971

**Tract Description of the  
United States of America Tract (100b)  
Caddo Lake National Wildlife Refuge  
Harrison County, Texas**

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, United States of America (USA) tract (100b) being part of the Water Pump Station Reservation, Longhorn Ordnance Works, Tract B-51, as surveyed in March, 1943 for the War Department by Milard H. Hackney, a Licensed State Land Surveyor in and for the State of Texas, said tract (100b) being more particularly described by metes and bounds as follows:

**SURVEYOR'S NOTE:**

This tract description is based on said 1943 survey and existing boundary evidence found in the field and lying within and immediately adjacent to the boundaries of said Reservation. Adjustments were made according to field evidence found. All existing concrete monuments referred to in the hereinafter description are as described in said 1943 survey. All bearings and distances are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, N.A.D. 1983 (92). The average Combined Scale Factor applied equals 0.99988410; Convergence equals 02°21'53". The computed land area is based on surface distances.

**Commencing** at an existing concrete monument in the west side of the Karnack-Pine Island Road, said monument being described as Monument #1-A and being the southeast corner of said Reservation as described in said 1943 survey, said point having a coordinate value of N=6963762.14, E=3300336.58;

**THENCE**, along the west line of the Karnack-Pine Island Road and the east boundary line of said Reservation,

N. 03°00'33" W., 30.34 feet

to the **POINT OF BEGINNING**, said point being a standard United States Fish and Wildlife Service (USFWS) aluminum monument marked "Mon. No. 1-B, LS 4971, 2004" set for a corner of this tract, said point being in the east boundary line of said Reservation, the west line of said Karnack-Pine Island Road and 5.00 feet south of the existing pump station fence, said point having a coordinate value of N=6963793.049, E=3300334.991;

**THENCE**, departing the west line of said Karnack-Pine Island Road, along the south line of the said pump station fence,

N. 55°39'52" W., 807.02 feet

to a standard USFWS aluminum monument marked "Mon. No.2-B, LS 4971, 2004" set for a corner of this tract, said point being in the west line of said Reservation and in the east bank of Big Cypress Bayou, formerly called Black Cypress Bayou as described in said 1943 survey;

**THENCE**, along the west boundary line of said Reservation and the east bank of Big Cypress Bayou,

N. 12°54'55" E., 434.34 feet

to a point in the east bank of Big Cypress Bayou;

**THENCE**, continuing along the west boundary line of said Reservation and the east bank of Big Cypress Bayou,

N. 07°55'24" E., 292.27 feet

to a standard USFWS aluminum monument marked "Mon. No.3-B, LS 4971, 2004" set over an existing ½ inch iron pin for a corner of this tract and for a corner of said pump station, said point being at the existing pump station fence line;

**THENCE**, departing the east bank of Big Cypress Bayou, along the existing pump station fence line, at 152.06 feet, an existing ½ inch iron pin, and in all,

N. 89°36'28" E., 153.00 feet

to a standard USFWS aluminum monument marked "Mon. No.4-B, LS 4971, 2004" set for a corner of this tract, said point being in the east boundary line of said Reservation and the west line of said Karnack-Pine Island Road;

**THENCE**, along the east boundary of the said Reservation and the west line of said Karnack-Pine Island Road,

S. 23°40'41" E., 479.14 feet

to a standard USFWS aluminum monument marked "Mon. No.5-A, LS 4971, 2004" set for a corner of this tract and a corner of said Reservation;

**THENCE**, continuing along east boundary of the said Reservation and the west side of said Karnack-Pine Island Road,

S. 18°59'22" E., 526.76 feet

to an existing concrete monument for a corner of this tract and a corner of said Reservation, said monument being described as Monument #6-A in said 1943 survey, said point being in the east boundary line of said Reservation and the west line of said Karnack-Pine Island Road;

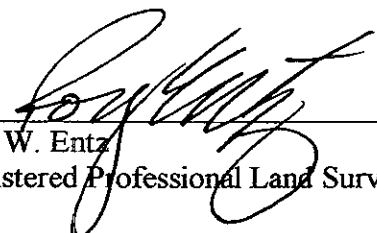
**THENCE**, continuing along the east boundary line of said Reservation and west line of said Karnack-Pine Island Road

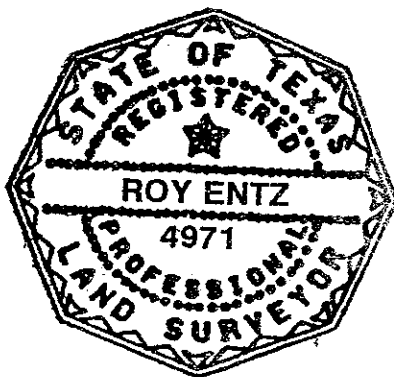
S. 03°00'33" E., 232.50 feet

to the **POINT OF BEGINNING**, and containing 9.18 acres, more or less;

The herinbefore described tract of land is delineated on a plat designated "United States of America Tract (100a,b)", bearing the date of May, 2004, of record in the files of the United States Department of the Interior, Fish and Wildlife Service.

May, 2004

  
\_\_\_\_\_  
Roy W. Entz  
Registered Professional Land Surveyor #4971



# **ATTACHMENT 2**



**PARTIAL ASSIGNMENT OF PERMIT TO  
APPROPRIATE WATER RIGHTS**

THE STATE OF TEXAS   X

COUNTY OF TARRANT   X

**THIS Partial Assignment of Permit to Appropriate Water Rights (the "Assignment")** is made this the 29th day of April, 2004, by and between the **United States of America**, acting by and through the Administrator of General Services ("GSA") by and through its authorized representatives, 819 Taylor, Rm 11A31, Fort Worth, Texas, 76102, under and pursuant to the Federal Property Act, 40 U.S.C. §§550, et seq, as amended, and all rules, orders and regulations issued pursuant thereto, and 16 U.S.C. §667b, as amended, (hereinafter sometimes called "Grantor"),

and the **United States of America**, acting by and through the United States Fish and Wildlife Service, ("USFWS") as Grantee.

**WITNESSETH:**

**WHEREAS**, the United States of America, by and through the United States Department of the Army ("U.S. Army") currently holds a Permit to Appropriate State Water, (the "Water Permit") Permit No. 4005, granted by the State of Texas on July 28, 1983, covering Harrison County, Big Cypress Bayou Watercourse, Cypress Creek Basin, comprising 2,343 acre-feet for municipal purposes per year, and 37,180 acre-feet for industrial purposes per year, a true and correct copy of the Permit is attached hereto, marked **Attachment 1**, which is hereby incorporated by reference and made a part hereof; and,

**WHEREAS**, all the water rights to be conveyed herein has heretofore been declared excess to the needs of the United States of America by the United States Department of the Army and the respective interests to be conveyed hereby has been reported to GSA and has been determined to be excess for disposal pursuant to said Federal Property Act, acting pursuant to the above referred laws, regulations and orders; and,

**WHEREAS**, GSA is willing to assign to USFWS its right, title, and interest in and to the following portion of the aforementioned water rights held under the Permit to the USFWS:

(1,757 acre-feet for municipal purposes per year and  
(27,885 acre-feet for industrial purposes per year); and,

**WHEREAS**, GSA shall retain the following remaining water rights held under the Permit:

(9,295 acre-feet for industrial purposes per year, and  
(586 acre-feet for municipal purposes per year)

**NOW, THEREFORE, Grantor and Grantee** make the following respective conveyances, grants, assignments, reservations, restrictions, covenants, exceptions, notifications, conditions, and agreements hereinafter set forth.

**I. Assignment of the Water Rights**

Grantor, under and pursuant to the Federal Property Act, 40 U.S.C. §§550, et.seq., as amended, and all rules, orders and regulations issued pursuant thereto, and 16 U.S.C. §667b, as amended, does hereby grant, convey, assign, remise, and release to the Grantee, its successors and assigns, the following water rights held under the aforementioned Permit, to-wit:

(1,757 acre-feet for municipal purposes per year and  
27,885 acre-feet per for industrial purposes per year);

**TO HAVE AND TO HOLD** the same, for the use, benefit and behalf of the Grantee, its successors and assigns forever.

**I. Retention of Remainder of Water Rights**

Except as provided for in the aforementioned Assignment, Grantor, its successors and assigns, hereby reserves and retains all right, title, and interest remaining in the water rights, described in the aforementioned Permit, which is hereby identified as follows:

(9,295 acre-feet for industrial purposes per year, and  
(586 acre-feet for municipal purposes per year)

In accordance with the provisions of TAC 297.81297.83, Grantor will cause to be filed with the Texas Commission on Environmental Quality a Change of Ownership Form reflecting the Assignment.

**IN WITNESS WHEREOF**, the United States of America, by and through its authorized representatives, has caused these presents to be executed this 29<sup>th</sup> day of April, 2004.

UNITED STATES OF AMERICA  
Acting by and through the  
Administrator of General Services

By Craig E. Blair  
Craig E. Blair, Acting Director  
Real Property Disposal Division  
General Services Administration

THE STATE OF TEXAS     X

COUNTY OF TARRANT     X

BEFORE ME, a Notary Public in and for the State of Texas, on this day personally appeared Scott Arney, known to me to be the person whose name is subscribed to the foregoing Assignment, and known to me to be the Regional Administrator, General Services Administration, Greater Southwest Region, and acknowledged to me that the same was the act and deed of the United States of America and of the Administrator of General Services and that he executed the same as the voluntary act of the United States of America and of the Administrator of General Services for the purposes and consideration therein expressed and in the capacity therein stated.

**GIVEN UNDER MY HAND AND SEAL OF OFFICE** at Fort Worth, Texas,  
this 29<sup>th</sup> day of April, 2004.



Sara E. Meadors  
Notary Public State of Texas

My Commission Expires: 9-22-2005



032243

County, Texas. A third point of discharge shall be located 3000 feet due east of the southeast corner of J. W. Robinson Survey No. 601, Abstract No. 827, Harrison County, Texas.

Permittee shall not be required to install metering devices on the return flow streams prior to the diversion reaching 1281 acre feet per year. When the diversion exceeds this figure, the permittee shall have established a stream gauging station on each of the three streams and shall maintain records of monthly readings for return flow calculations.

#### 5. SPECIAL CONDITION

This permit is issued subject to the obligations of the State of Texas pursuant to the terms of the Red River Compact.

This permit is issued subject to all superior and senior water rights in the Cypress Creek Basin.

Permittee agrees to be bound by the terms, conditions and provisions contained herein and such agreement is a condition precedent to the granting of this permit.

All other matters requested in the application which are not specifically granted by this permit are denied.

This permit is issued subject to the Rules of the Texas Department of Water Resources and to the right of continual supervision of State water resources exercised by the Department.

#### TEXAS WATER COMMISSION

/s/ Felix McDonald  
Felix McDonald, Chairman

/s/ Lee B. M. Biggart  
Lee B. M. Biggart, Commissioner

/s/ John D. Stover  
John D. Stover, Commissioner

Date Issued:

August 22, 1983

Attest:

/s/ Mary Ann Hefner  
Mary Ann Hefner, Chief Clerk





Texas Commission on Environmental Quality  
PO BOX 13087 AUSTIN TEXAS 78711-3087  
Telephone (512) 239-4611, FAX (512) 239-4770

## CHANGE OF OWNERSHIP FORM

REQUEST FOR TRANSFER  
OF WATER USE PERMIT/CERTIFICATE NO. \_\_\_\_\_

Pursuant to TAC 297.81-297.83 relating to Conveyances of Land and Water Rights, the owners must provide the completed copy of this "Change of Ownership" form together with the following:

- (1) Certified and/or the executed copies of legal documents establishing a complete chain of title from the owner of record to the current owner. These documents usually consist of **deeds and other such conveyances or**, in case of an inheritance, the (a) **will**, (b) **probate order** and (c) **will inventory**.
- (2) **\$100 fee** for changing the ownership records of the permit/certificate of adjudication. Make your remittance payable to Texas Commission on Environmental Quality.

New Owner's Name: U.S. Fish and Wildlife Service

Interest only in 27,885 acre-feet for industrial purposes per year and  
1757 acre-feet for municipal purposes per year.

Address: Geoffrey Haskett, Deputy Regional Director  
P.O. Box 1306, 500 Gold Avenue, SW  
Albuquerque, NM 87102

Telephone No(s): Home: \_\_\_\_\_ Office: \_\_\_\_\_ Fax: \_\_\_\_\_

Customer Reference Number (if issued): CN \_\_\_\_\_

**Note:** If you do not have a Customer Reference Number, complete Section II of the Core Data Form (TCEQ-10400) and submit it with this application.

Witness \_\_\_\_\_ hand at \_\_\_\_\_, Texas, this the \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_.

(owner)

(owner)

Subscribed and sworn to as being true and correct before me this the \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_.

(Notary Public, State of Texas)

# **ATTACHMENT 3**

## ASSIGNMENT OF LEASE

THE STATE OF TEXAS X

COUNTY OF TARRANT X

**THIS Assignment of Lease (the "Lease Assignment")** is made this the 29th day of April, 2004, by and between the **United States of America**, acting by and through the Administrator of General Services ("GSA") by and through its authorized representatives, 819 Taylor, Rm 11A31, Fort Worth, Texas, 76102, under and pursuant to the Federal Property Act, 40 U.S.C. §§550, et seq, as amended, and all rules, orders and regulations issued pursuant thereto, and P.L. 80-537, 16 U.S.C. §667b, as amended,

and the **United States of America**, acting by and through the United States Fish and Wildlife Service, ("USFWS")

**WITNESSETH:**

**WHEREAS**, the United States of America, by and through the United States Department of the Army ("U.S. Army"), as Lessor, currently holds Lease No. DACA-63-1-97-0501 dated September 20, 1996, with the Caddo Lake Institute, Inc., a Colorado nonprofit corporation, as well as Supplemental Agreement No. 1 to Lease No. DACA-63-1-87-0501, between the same parties, dated August 9, 1999; (hereinafter jointly referred to as the "Lease"); true and correct copies which are attached hereto, marked **Attachment 1**, and which is hereby incorporated by reference and made a part hereof; and,

**WHEREAS**, all the leasehold rights to be conveyed herein has heretofore been declared excess to the needs of the United States of America by the United States Department of the Army and the respective interests to be conveyed hereby has been reported to GSA and has been determined to be excess for disposal pursuant to said Federal Property Act, acting pursuant to the above referred laws, regulations and orders; and,

**WHEREAS**, GSA is willing to assign its right, title, and interest in and to aforementioned leasehold estate to the USFWS, under and subject to all of the reservations, restrictions, covenants, exceptions, notifications, conditions and agreements thereafter set forth:

**NOW, THEREFORE, GSA and USFWS** make the following respective conveyances, grants, assignments, reservations, restrictions, covenants, exceptions, notifications, conditions, and agreements therein set forth.

**I. Assignment of the Lease**

GSA, under and pursuant to the Federal Property Act, 40 U.S.C. §§550, et seq., as amended, and all rules, orders and regulations issued pursuant thereto, and 16 U.S.C. §667b, as amended, does hereby grant, convey, assign, remise, and release to the USFWS, its successors and assigns, the right, title and interest in and to Lease No. DACA-63-1-97-0501 dated September 20, 1996, with the Caddo Lake Institute, Inc., a Colorado nonprofit corporation, as well as Supplemental Agreement No. 1 to Lease No. DACA-63-1-87-0501, between the same parties, dated August 9, 1999, under and subject to all of the reservations, restrictions, covenants, exceptions, notifications, conditions and agreements therein set forth.

**TO HAVE AND TO HOLD** the same, for the use, benefit and behalf of the Grantee, its successors and assigns forever, under and subject to all of the reservations, restrictions, covenants, exceptions, notifications, conditions and agreements therein set forth.

**IN WITNESS WHEREOF**, the United States of America, by and through its authorized representatives, has caused these presents to be executed this 29<sup>th</sup> day of April, 2004.

UNITED STATES OF AMERICA  
Acting by and through the  
Administrator of General Services

By Craig E. Blair  
Craig E. Blair Acting Director  
Real Property Disposal Division  
General Services Administration

THE STATE OF TEXAS     X  
COUNTY OF TARRANT    X

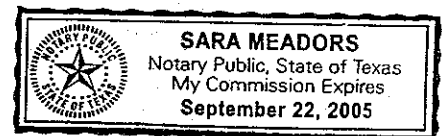
BEFORE ME, a Notary Public in and for the State of Texas, on this day personally appeared Scott Arney, known to me to be the person whose name is subscribed to the foregoing Assignment, and known to me to be the Regional Administrator, General Services Administration, Greater Southwest Region, and acknowledged to me that the same was the act and deed of the United States of America and of the Administrator of General Services and that he executed the same as the voluntary act of the United States of America and of the Administrator of General Services for the purposes and consideration therein expressed and in the capacity therein stated.

**GIVEN UNDER MY HAND AND SEAL OF OFFICE** at Fort Worth, Texas,  
this 29<sup>th</sup> day of April, 2004.



Sara G. Meadors  
Notary Public State of Texas

My Commission Expires: 9-22-2005





SUPPLEMENTAL AGREEMENT No. 1  
TO  
LEASE No. DACA63-1-97-0501  
CADDO LAKE INSTITUTE, INC.  
AT  
LONGHORN ARMY AMMUNITION PLANT, TEXAS

This Supplemental Agreement No. 1 is entered into by and between the Secretary of the Army, and the Caddo Lake Institute, Inc., hereinafter referred to as the Lessee;

WHEREAS, the Secretary of the Army, on 4 October 1996, under the above-numbered lease, leased to the Caddo Lake Institute, Inc., for a term of thirty (30) years, beginning 1 October 1996 and ending 30 September 2026, approximately 1395 acres of land and improvements, as more specifically described in said original lease; and

WHEREAS, the Lessee has requested that the original lease be supplemented to increase the area to include six additional buildings identified as Buildings Nos. 702, 707, 736, 703B, 703D and 703E, with appurtenant grounds, parking areas, road and utility access in Woodland Management Unit 26; and

WHEREAS, the Secretary of the Army is agreeable thereto;

NOW THEREFORE, by mutual agreement of the parties hereto, the original lease is hereby supplemented in the following respects only or hereinafter expressed:

1. That portion of the lease which reads as follows: "That the Secretary, by authority of Title 10 United States Code Section 2667, and for the consideration hereinafter described in Exhibit A..." is amended to read as follows: "That the Secretary, by authority of Title 10 United States Code Section 2667, and for the consideration hereinafter described in Exhibit A-1 and A-2..."

2. That Exhibits D - I, Inventory and Condition Reports are added hereto to include personal property, improvements, and the environmental condition (Preliminary Assessment Screening) prior to execution of this Supplemental Agreement No. 1.



NO DACA63-1-97-0501

DEPARTMENT OF THE ARMY LEASE  
LONGHORN ARMY AMMUNITION PLANT  
HARRISON COUNTY, TEXAS

THIS LEASE is made on behalf of the United States, between the SECRETARY OF THE ARMY, hereinafter referred to as the "Secretary," "Army," or "Lessor" and THE CADDO LAKE INSTITUTE, INC., hereinafter referred to as the Lessee.

## WITNESSETH:

That the Secretary, by the authority of Title 10 United States Code Section 2667, and for the consideration hereinafter set forth, hereby leases to the Lessee the property described in Exhibit A, a map showing the exterior perimeters of Woodland Management Units 11 and 12, which include the Starr Ranch parcel, with improvements, and the Harrison Bayou natural area, which is generally below the 200 foot elevation contour line shown on USGS quadrangle maps, excluding contaminated areas, totaling 1395 acres more or less (hereinafter called the "premises" or "leased premises"). The Lessee, at its expense, will complete a survey of the leased premises, which is satisfactory to the Secretary, as soon as practicable. Upon completion of said survey the parties will amend this lease to include a more accurate description of the leased premises.

THIS LEASE is granted subject to the following conditions:

## 1. USE OF THE LEASED PREMISES.

a. The sole purposes for which the premises and any improvements thereon may be used, in the absence of prior written approval of the Army for any other use, is for the purposes of promoting development of projects with academic, institutional and other agencies which will assure the long-term continuation, maintenance or improvement of the area's rich and diverse cultural, biological and ecological values, functions, training and demonstration opportunities. Use by the Institute shall be consistent with and complimentary to the LHAAP Natural Resource Management Plan and the Department of Army's conservation and stewardship responsibilities under federal law.

b. In order to obtain permission to change the use of the leased premises beyond the uses specified in this Lease,

the Lessee must submit a request with supporting environmental documents through the Installation Commander's Representative, Longhorn Army Ammunition Plant, to the Headquarters, Industrial Operations Command (IOC), ATTN: AMSIO-ISR, for approval by the Secretary. The Lessee shall furnish, at the Lessee's expense, this and any additional environmental analysis and documentation, deemed necessary by the Secretary to comply with the National Environmental Policy Act of 1969, as amended, and implementing regulations, and other applicable environmental laws and regulations, prior to approval of a change in use.

c. The Lessee will not alter, modify, demolish, or otherwise make changes to the existing Army facilities or construct new facilities on the leased premises without receiving prior written approval from the Secretary. All proposals for facility alteration and new construction must be submitted through the Installation Commander's Representative, LHAAP to Headquarters, IOC, ATTN: AMSIO-ISR, for review and approval by the Secretary. The cost of preparation of supporting environmental documents shall be borne by the Lessee.

d. The Memorandum of Agreement between the parties dated September 20, 1996, attached hereto as Exhibit B, contemplates that the Lessee will propose future improvements and changes in uses at limited locations within the leased premises for the purpose of implementing its part of the United States Governments' 1996 Brisbane Ramsar Pledge, which improvement and management proposals will be the subject of subsequent review and processing in accordance with the provision of this Lease.

e. The right is reserved to the United States, its officers, agents, and employees to enter upon the premises at any time and for any purpose necessary or convenient in connection with government purposes and to manipulate the level of Caddo Lake, thereby flooding the leased premises, and the Lessee shall have no claim for damages on account thereof against the United States or any officer, agent, or employee thereof.

## 2. TERM

Said premises are hereby leased for a term of 30 years, beginning October 1, 1996, and ending September 30, 2026.

## 3. CONSIDERATION

a. As consideration for this lease, the Lessee shall pay the estimated fair market rental, cash, in advance to the United States in the amount of TEN THOUSAND DOLLARS

(\$10,000.00), payable annually to the order of the Finance and Accounting Officer, Fort Worth District, and delivered to the District Engineer, Attention: Chief, Real Estate Division (CESWF-RE-MD), P. O. Box 17300, Fort Worth, Texas 76102-0300. The Lessee shall have the option to pay said rent in quarterly installments. The rental will be reviewed every ten (10) years and adjusted, either up or down, as established by a mutually agreeable outside professional appraiser, the cost of the appraisal to be paid by the Lessee. Cash rental may be offset by the value of work items which are accomplished by the Lessee for the maintenance, protection, repair, restoration, or improvement of the leased premises, as described in a Work Plan proposed by the Lessee, submitted at least annually, and approved by the Installation Commander in accordance with 10 U.S.C. 2667(b)(5) and to the extent consistent with the purposes of the lease. Said Work Plans will be attached hereto in the form of a Supplemental Agreement.

b. All rent and other payments due under the terms of this lease must be paid on or before the date they are due in order to avoid the mandatory sanctions imposed by the Debt Collection Act of 1982, (31 U.S.C. Section 3717). This statute requires the imposition of an interest charge for the late payment of debts owed to the United States; an administrative charge to cover the costs of processing and handling delinquent debts; and the assessment of an additional penalty charge on any portion of a debt that is more than 90 days past due. The provisions of the statute will be implemented as follows:

(1) The United States will impose an interest charge, the amount to be determined by law or regulation, on late payment of rent. Interest will accrue from the due date. An administrative charge to cover the cost of processing and handling each late payment will also be imposed.

(2) In addition to the charges set forth above, the United States will impose a penalty charge of six percent (6%) per annum on any payment, or portion thereof, more than ninety (90) days past due. The penalty shall accrue from the date of delinquency and will continue to accrue until the debt is paid in full.

(3) All payments received will be applied first to any accumulated interest, administrative and penalty charges and then to any unpaid rental or other payment balance. Interest will not accrue on any administrative or late payment penalty charge.

#### 4. NOTICES



All correspondence and notices to be given pursuant to this lease shall be addressed, if to the Lessee, to Mr. Dwight Shellman, President and General Counsel, The Caddo Lake Institute, Inc., Post Office Box 2710, Aspen, Colorado 81612-2710, and, if to the United States, to the District Engineer, Attention: Chief, Real Estate Division (CESWF-RE-MD), P. O. Box 17300, Fort Worth, Texas 76102-0300, or as may from time to time otherwise be directed by the parties. Notices must be given in a properly sealed envelope, addressed as aforesaid, and deposited postage prepaid by either registered mail, return receipt requested, or by certified mail, return receipt requested in a post office regularly maintained by the United States Postal Service. The service of the notice shall be deemed complete upon the receipt of said notice, or the refusal thereof, by the applicable party.

#### 5. AUTHORIZED REPRESENTATIVES

Except as otherwise specifically provided, any reference herein to "Secretary", "District Engineer", or "said officer" shall include their duly authorized representatives. Any reference to "Lessee" shall include any sublessees, assignees, transferees, successors and their duly authorized representatives.

#### 6. SUPERVISION BY THE DISTRICT ENGINEER

The use and occupation of the premises shall be subject to the general supervision and approval of the District Engineer, Fort Worth District, U. S. Army Corps of Engineers, hereinafter referred to as said officer, and to such rules and regulations as may be prescribed from time to time by said officer.

#### 7. APPLICABLE LAWS AND REGULATIONS

a. Throughout the term of this lease, the Lessee shall, with regard to the leased premises, at its own cost and expense, promptly observe and comply with all applicable laws, orders, regulations, rules, ordinances, and requirements of the federal, state, county and local governments and of all of their administrative departments, bureaus and officials. The Lessee shall pay all costs, expenses, claims, fines, penalties and damages that may in any manner arise out of or be imposed because of the failure of the Lessee to comply with said laws.

b. The United States' rights under this Lease specifically include the right for United States officials to inspect, upon reasonable notice, the leased premises for compliance with environmental, safety; and occupational health laws and regulations, whether or not the United States is responsible for enforcing them. Such inspections

are without prejudice to the right of duly constituted enforcement officials to make such inspections. The Lessee shall have no claim on account of any entries against the United States or any officer, agent, employee, or contractor thereof.

#### 8. CONDITION OF PREMISES AND REMEDIATION ACTIVITIES

a. The Lessee acknowledges that it has inspected the leased premises, knows its condition, and understands that the same is leased without any representations or warranties whatsoever and without obligation on the part of the United States to make any alterations, repairs, or additions thereto.

b. The Secretary and the Lessee have conducted an inventory and condition survey of the premises, to include personal property, improvements, and the environmental condition, prior to lease execution by either party. The inventory and condition survey is documented in a survey report (Survey) prepared by the Secretary, signed by the duly authorized representatives of both parties, and attached as Exhibit C to this lease. The Survey will refer to and incorporate by reference the Preliminary Assessment Screening (PAS), dated September 12, 1996, prepared by the Army, as well as any other environmental conditions that may not be specifically identified in the PAS. The PAS is attached hereto with the Survey at Exhibit C. The Lessee hereby acknowledges receipt of the Survey and the PAS. A Preliminary Assessment Screening (PAS) documents the known history of the property with regard to the storage, release or disposal of hazardous substances thereon. Upon expiration, revocation or relinquishment of this lease, the Army and the Lessee will jointly conduct a close-out survey. The close-out survey and report will include an updated PAS. All significant variances from the initial Survey shall be clearly documented in the close-out report. This close-out report will constitute the basis for settlement by the parties for any leased property shown to be lost, damaged, contaminated, or destroyed during the lease term. Any property must be either replaced or restored to the condition required by the condition on Protection of Property and Restoration of the premises as required in the condition on Restoration.

c. The parties acknowledge that Long Horn Army Ammunition Plant has been identified as a National Priorities List Site under CERCLA. The Lessee acknowledges that the Army has provided it with a copy of the FFA and will provide the Lessee with a copy of any amendments thereto. The Lessee agrees to abide by the applicable terms of the FFA and any documents originating therefrom, and further agrees that should any conflict arise between the terms of the FFA, as it may be amended, and the Lease, the

Lessee. The Lessee agrees to comply with the provisions of any health or safety plan in effect during the course of the above-described response or remedial actions.

f. The Lessee will be responsible for maintenance and repair of the leased premises, facilities, properties, equipment, and of any utility infrastructure situated within the boundaries of the leased premises. The Lessee shall, at a minimum, maintain the leased premises to the condition in which received at the commencement of the lease, minus reasonable fair wear and tear. All maintenance and repair work performed by the Lessee shall comply with applicable Federal, state, and local laws and regulations.

## 9. TRANSFERS, ASSIGNMENTS, AND SUBLEASES

a. Without prior written approval of the District Engineer, the Lessee shall neither transfer nor assign this lease, nor sublet the premises or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this lease. Failure to comply with this condition shall constitute a noncompliance for which the lease may be revoked immediately by the District Engineer.

b. With respect to subleasing only, the Army's consent shall not be unreasonably withheld or delayed and shall be deemed granted if a response is not received by the Lessee within twenty-one (21) days of the receipt by the Army of a written request for consent. Every sublease shall specifically state that it is subject to the terms and conditions of this lease and that, in case of any conflict between the instruments, this lease will control. The Lessee shall provide each sublessee with a copy of this Lease.

c. The Army encourages the Lessee to make the leased premises available to other users for educational and scientific purposes in accordance with this Lease. In particular, the Lessee intends to solicit other academic and scientific users to become sublessees in accordance with this Lease. The Lessee may require that sublessees that it selects share the costs and responsibilities under this lease and that such sublessee activities be consistent with the Lessee's institutional objectives for the leased premises and this Lease. The Lessee may prescribe reasonable terms and conditions for such uses consistent with this Lease.

## 10. UTILITIES

a. The Army shall be under no obligation to furnish utilities or services. The Lessee will be responsible for acquiring the utilities it requires. The Army will grant

necessary easements if the Lessee chooses to have utilities provided by a public utility company.

b. Fire protection and ambulance services are not available from Longhorn Army Ammunition Plant. The Lessee is, therefore, required to provide its own fire protection and ambulance services. The Lessee is further required to comply with all applicable installation, federal, state and local fire protection and safety regulations and requirements.

c. There are no refuse collection or landfill services available from the installation. The Lessee will be responsible for all refuse removal from the leased premises in accordance with installation regulations and local requirements.

#### 11. PROTECTION OF PROPERTY

The Lessee shall keep the premises in good order and in a clean, safe condition by and at the expense of the Lessee. The Lessee shall be responsible for any damage that may be caused to property of the United States by the activities of the Lessee under this lease, and shall exercise due diligence in the protection of all property located on the premises against fire or damage from any and all other causes. Any property of the United States damaged or destroyed by the Lessee incident to the exercise of the privileges herein granted shall be promptly repaired or replaced by the Lessee to a condition satisfactory to said officer, or at the election of said officer, reimbursement made therefor by the Lessee in an amount necessary to restore or replace the property to a condition satisfactory to said officer.

#### 12. INSURANCE

a. At the commencement of this lease, the Lessee shall obtain, from a reputable insurance company, or companies, liability insurance. The insurance shall provide an amount not less than that which is prudent, reasonable and consistent with sound business practices or a minimum combined single limit of \$1,000,000, whichever is greater, for any number of persons or claims arising from any one incident with respect to bodily injuries or death resulting therefrom, property damage, or both, suffered or alleged to have been suffered by any person or persons resulting from the operations of the Lessee under the terms of this lease. The Lessee shall require its insurance company to furnish to the District Engineer a copy of the policy or policies, or if acceptable to the District Engineer, certificates of insurance evidencing the purchase of such insurance. The minimum amount of liability insurance coverage is subject to

revision by the District Engineer every three years or upon renewal or modification of this lease.

b. The insurance policy or policies shall be of comprehensive form of contract and shall specifically provide protection appropriate for the types of facilities, services and activities involved. The Lessee shall require that the insurance company give the District Engineer thirty (30) days written notice of any cancellation or change in such insurance. The District Engineer may require closure of any or all of the premises during any period for which the Lessee does not have the required insurance coverage.

c. As to those structures and improvements on the premises constructed by or owned by the United States, for such periods as the Lessee is in possession of the premises pursuant to the terms and conditions of this lease, the Lessee shall procure and maintain at the Lessee's cost a standard fire and extended coverage insurance policy or policies on the structures and improvements to the full insurable value thereof. Coverage shall be sufficient to cover the appraised value of the buildings and improvements insured hereunder as of the date of this Lease. The Lessee shall procure such insurance from a reputable company or companies. The insurance policy shall provide that in the event of loss thereunder, the proceeds of the policy or policies, at the election of the United States, shall be payable to the Lessee to be used solely for the repair, restoration or replacement of the property damaged or destroyed, and any balance of the proceeds not required for such repair, restoration or replacement shall be paid to the United States. If the United States does not elect by notice in writing to the insurer within sixty (60) days after the damage or destruction occurs to have the proceeds paid to the Lessee for the purposes hereinabove set forth, then such proceeds shall be paid to the United States, provided however that the insurer, after payment of any proceeds to the lessee in accordance with the provision of the policy or policies, shall have no obligation or liability with respect to the use or disposition of the proceeds by the lessee. Nothing herein contained shall be construed as an obligation upon the United States to repair, restore or replace the leased premises or any part thereof.

### 13. INDEMNITY

a. The Lessee agrees to assume all risks of loss or damage to property and injury or death to persons by reason of or incident to its possession and/or use of the leased premises or the activities conducted under this Lease. The Lessee expressly waives all claims against the United States of America for any such loss, damage, personal injury or death caused by or occurring as a consequence of such possession and/or use of the leased premises by the Lessee,



or the conduct of activities or the performance of responsibilities under this lease by the Lessee. The Lessee further agrees to indemnify and hold harmless the United States, its officers, agents and employees, from and against all suits, claims, demands or actions, liabilities, judgments, costs and attorneys' fees arising out of, or in any manner predicated upon, personal injury, death or property damage resulting from, related to, caused by or arising out of the possession and/or use of the leased premises by the Lessee. The indemnification obligations of the Lessee contained herein do not extend to damages, claims, suits, liabilities, judgments, costs and attorney's fees arising out of, caused by or predicated upon activities undertaken by the Army in relation to the CERCLA clean-up of the leased premises. The Army will give the Lessee notice of any claim against it covered by this indemnity as soon after learning of such claim as practicable.

b. The Lessee will be responsible for the security and safety of persons or property on the leased premises as a result of the lessee's use. The Lessee will assist Longhorn Army Ammunition Plant with controlling unauthorized use of the leased premises.

c. The Lessee shall indemnify and hold harmless the United States of America from any costs, expenses, liabilities, fines, or penalties resulting from discharges, releases, emissions, spills, storage, disposal, or any other action by the Lessee giving rise to United States of America liability, civil or criminal, or responsibility under federal, state or local environmental laws.

d. This condition 13 and the obligations of the Lessee hereunder shall survive the expiration or termination of the lease and any conveyance of the leased premises to the Lessee. The Lessee's obligation hereunder shall apply whenever the United States of America incurs costs or liabilities for the Lessee's actions giving rise to liability under this Article.

#### 14. RESTORATION

On or before the expiration of this lease or its termination by the Lessee, the Lessee shall vacate the premises, remove the property of the Lessee, and restore the premises to a condition satisfactory to said officer. If, however, this lease is revoked, the Lessee shall vacate the premises, remove said property and restore the premises to the aforesaid condition within such time as the said officer may designate or as otherwise specified by the provisions of the condition on RENTAL ADJUSTMENT. In either event, if the Lessee shall fail or neglect to remove said property and

restore the premises, then, at the option of the said officer, the property shall either become the property of the United States without compensation therefor, or the said officer may cause the property to be removed and no claim for damages against the United States or its officers or agents shall be created by or made on account of such removal and restoration work. The Lessee shall also pay the United States on demand any sum which may be expended by the United States after the expiration, revocation, or termination of this lease in restoring the premises.

#### 15. NON-DISCRIMINATION

The Lessee shall not discriminate against any person or persons or exclude them from participation in the Lessee's operations, programs or activities conducted on the leased premises, because of race, color, religion, sex, age, handicap or national origin. The Lessee will comply with the Americans with Disabilities Act and attendant Americans with Disabilities Act Accessibility Guidelines (ADAAG) published by the Architectural and Transportation Barriers Compliance Board.

#### 16. SUBJECT TO EASEMENTS

This lease is subject to all existing easements, or those subsequently granted as well as established access routes for roadways and utilities located, or to be located, on the premises, provided that the proposed grant of any new easement or route will be coordinated with the Lessee, and easements will not be granted which will, in the opinion of the District Engineer, interfere with the use of the premises by the Lessee.

#### 17. SUBJECT TO MINERAL INTERESTS

a. This lease is subject to all outstanding mineral interests. As to federally owned mineral interests, it is understood that they may be included in present or future mineral leases issued by the Bureau of Land Management (BLM) which has responsibility for mineral development on federal lands. The Secretary will provide lease stipulations to BLM for inclusion in said mineral leases that are designed to protect the premises from activities that would interfere with the lessee's operations or would be contrary to local law.

b. The Army acknowledges there are preexisting oil and gas development leases covering essentially the entire installation. The Installation Commander has the right and responsibility under terms of those leases to approve all requested drilling sites. The Army hereby agrees that it will not approve any drilling sites within the boundaries of wetlands study areas on the leased premises.

## 18. TERMINATION

a. This lease may be terminated by the Lessee at any time by giving the District Engineer at least thirty (30) days notice in writing provided that no refund by the United States of any rental previously paid shall be made, and provided further, that in the event that said notice is not given at least thirty (30) days prior to the rental due date, the Lessee shall be required to pay the rental for the period shown in the condition on CONSIDERATION.

b. The Lessee understands that this Lease is made subject to homeless assistance screening under the Stewart B. McKinney Homeless Assistance Act, 42 U.S.C. 11411. The Army reserves the right to revoke this lease with respect to all or any portion of the leased premises as is necessary to meet the requirements under 42 U.S.C. 11411. The Lessor shall initiate and complete screening in accordance with applicable regulations within nine months of the date of this Lease. In the event of revocation under this condition 18, the Lessee shall be entitled to a rental adjustment under the condition on Rental Adjustment, but shall not be entitled to any other compensation whatsoever and shall have no other claim against the Army.

c. The following shall be deemed a default by either the Army or the Lessee and a breach of this lease: a party's failure to observe or perform any of its obligations under the terms, covenants or conditions of this lease, which failure persists after the expiration of thirty (30) days from the date the aggrieved party gives written notice to the party calling attention to the existence of that failure. However, if the default is one relating to a matter that exposes occupants or the public to an imminent danger to safety or health of which the public authorities have given due notice to the party, then such shorter notice to the party, whether written or otherwise, shall be sufficient notice of default under this lease.

d. In the event of a default, as provided in condition 18c. above, the aggrieved party may, at its option, following the expiration of applicable notice and grace periods: (a) seek injunctive relief, monetary damages, or both; (b) take such measures as the aggrieved party deems reasonable to mitigate the effects of or cure such default, and assess all costs incurred for such mitigation to the defaulting party; (c) terminate this lease; or (d) avail itself of any combination of said remedies.

## 19. RENTAL ADJUSTMENT

In the event the United States, in accordance with the provisions of this Lease, terminates or revokes this lease or in any other manner materially reduces the leased area or materially affects its use by the Lessee prior to the expiration date, an equitable adjustment will be made in the rental paid or to be paid under this lease. Such adjustment of rental shall be evidenced by a supplemental agreement in writing; PROVIDED however, that none of the provisions of this paragraph shall apply in the event of revocation because of noncompliance by the Lessee with any of the terms and conditions of this lease.

## 20. PROHIBITED USES

a. The Lessee shall not permit gambling on the premises or install or operate, or permit to be installed or operated thereon, any device which is illegal; or use the premises or permit them to be used for any illegal business or purpose. There shall not be conducted on or permitted upon the premises any activity which would constitute a nuisance. The Lessee shall not sell, store or dispense, or permit the sale, storage, or dispensing of beer or other intoxicating liquors on the premises.

b. The Lessee shall not construct or place any structure, improvement or advertising sign or allow or permit such construction or placement without prior written approval of the District Engineer.

## 21. NATURAL RESOURCES

The Lessee shall cut no timber, conduct no mining operations, remove no sand, gravel, or kindred substances from the ground, commit no waste of any kind, nor in any manner substantially change the contour or condition of the premises except as authorized in writing by the District Engineer.

## 22. DISPUTES CLAUSE

a. Except as provided in the Contract Disputes Act of 1978 (41 U.S.C. 601-613) (the Act), all disputes arising under or relating to this lease shall be resolved under this clause and the provisions of the Act.

b. "Claim", as used in this clause, means a written demand or written assertion by the Lessee seeking, as a matter of right, the payment of money in a sum certain, the adjustment of interpretation of lease terms, or other relief arising under or relating to this lease. A claim arising under this lease, unlike a claim relating to this lease, is a claim that can be resolved under a lease clause that provides for the relief sought by the Lessee. However, a

written demand or written assertion by the Lessee seeking the payment of money exceeding \$100,000 is not a claim under the Act until certified as required by subparagraph c.(2) below. The routine request for rental payments that is not in dispute is not a claim under the Act. The request may be converted to a claim under the Act, by this clause, if it is disputed either as a liability or amount or is not acted upon in a reasonable time.

c.(1) A Claim by the Lessee shall be made in writing and submitted to the District Engineer for a written decision. A claim by the Government against the Lessee shall be subject to a written decision by the District Engineer.

(2) For Lessee claims exceeding \$100,000, the Lessee shall submit with the claim a certification that--

(i) the claim is made in good faith; and

(ii) supporting data are accurate and complete to the best of the Lessee's knowledge and belief;

(iii) and the amount requested accurately reflects the lease adjustment for which the Lessee believes the Government is liable.

(3) If the Lessee is an individual, the certificate shall be executed by that individual. If the Lessee is not an individual, the certification shall be executed by --

(i) a senior company official in charge of the Lessee's location involved; or

(ii) an officer or general partner of the lessee having overall responsibility of the conduct of the Lessee's affairs.

d. For Lessee claims of \$100,000 or less, the District Engineer must, if requested in writing by the Lessee, render a decision within 60 days of the request. For lessee-certified claims over \$100,000, the District Engineer must, within 60 days, decide the claim or notify the Lessee of the date by which the decision will be made.

e. The District Engineer's decision shall be final unless the Lessee appeals or files a suit as provided in the Act.

f. At the time a claim by the Lessee is submitted to the District Engineer or a claim by the Government is presented to the lessee, the parties, by mutual consent, may agree to use alternative means of dispute resolution. When using alternate dispute resolution procedures, any claim,

regardless of amount, shall be accompanied by the certificate described in paragraph c.(2) of this clause, and executed in accordance with paragraph c.(3) of this clause.

g. The Government shall pay interest on the amount found due and unpaid by the Government from (1) the date the District Engineer received the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the District Engineer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim. Rental amounts due to the Government by the Lessee will have interest and penalties as set out in the condition on CONSIDERATION.

h. The Lessee shall proceed diligently with the performance of the lease, pending final resolution of any request for relief, claim, or action arising under the lease, and comply with any decision of the District Engineer.

### 23. ENVIRONMENTAL PROTECTION

a. Within the limits of their respective legal powers, the parties to this lease shall protect the premises against pollution of its air, ground, and water. The Lessee shall comply with any laws, regulations, conditions, or instructions affecting the activity hereby authorized if and when issued by the Environmental Protection Agency, or any Federal, state, interstate or local governmental agency having jurisdiction to abate or prevent pollution. The disposal of any toxic or hazardous materials within the premises is specifically prohibited. Such regulations, conditions, or instructions in effect or prescribed by said Environmental Protection Agency, or any federal, State, interstate or local governmental agency are hereby made a condition of this lease. The Lessee shall not discharge waste or effluent from the premises in such a manner that the discharge will contaminate streams or other bodies of water or otherwise become a public nuisance.

b. The Lessee will use all reasonable means available to protect the environment and natural resources, and where damage nonetheless occurs from activities of the Lessee, the Lessee shall be liable to restore the damaged resources.

c. The Lessee must obtain approval in writing from said officer before any pesticides or herbicides are applied to the premises.



d. The Lessee must report monthly pesticide usage to the installation pest management coordinator within 3 work days of the end of the month of application. Negative reports are not required. Only EPA approved pesticides are authorized, and application must be in accordance with the manufacturer's instructions appearing on the original shipping container. Empty containers or unused pesticides must be disposed of off the installation in accordance with EPA disposal standards by the end of each workday.

e. NOTICE OF THE PRESENCE OF LEAD-BASED PAINT AND COVENANT

(1) The Lessee is hereby informed and does acknowledge that all buildings on the leased premises, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing ("target housing") lessors must disclose to lessees and sublessees the presence of lead-based paint and/or lead-based paint hazards therein. "Target housing" means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing) or any 0-bedroom dwelling.

(2) Available information concerning known lead-based paint and/or lead-based paint hazards, the location of lead-based paint and/or lead-based paint hazards, and the condition of painted surfaces is contained in the Report of Availability, which has been provided to the Lessee. All lessees and sublessees must also receive the federally-approved pamphlet on lead poisoning prevention. The Lessee hereby acknowledges receipt of all of the information described in this subparagraph.

(3) The Lessee shall not permit the occupancy of any target housing without complying with this section and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. Prior to permitting the occupancy of target housing, if required by law or regulation, the Lessee, at its expense, will abate and eliminate lead-based paint hazards by treating any defective lead-based paint surface in accordance with all applicable laws and regulations.

f. NOTICE OF THE PRESENCE OF ASBESTOS AND COVENANT

a. The Lessee is hereby informed and does acknowledge that asbestos or asbestos-containing materials (collectively "ACM") has been found on the leased premises, as described in the Report of Availability. The ACM on the leased premises does not currently pose a threat to human health or the environment.

b. The Lessee covenants and agrees that: (1) its use and occupancy of the leased premises will be in compliance with all applicable laws relating to asbestos; (2) it will be responsible for any and all remediation of asbestos found to be necessary during the lease term; and (3) the Army assumes no liability for damages for personal injury, illness, disability, or death, to the Lessee, its successors or assigns, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with asbestos on the leased premises described in this Lease, whether the Lessee, its successors, or assigns have properly warned or failed properly to warn the individual(s) injured.

#### 24. HISTORIC PRESERVATION

The Lessee shall not remove or disturb, or cause or permit to be removed or disturbed, any historical, archeological, architectural or other cultural artifacts, relics, remains or objects of antiquity. In the event such items are discovered on the premises, the Lessee shall immediately notify said officer and protect the site and the material from further disturbance until said officer gives clearance to proceed.

#### 25. SOIL AND WATER CONSERVATION

The Lessee shall maintain, in a manner satisfactory to said officer, all soil and water conservation structures that may be in existence upon said premises at the beginning of or that may be constructed by the Lessee during the term of this lease, and the Lessee shall take appropriate measures to prevent or control soil erosion within the premises. Any soil erosion occurring outside the premises, resulting from the activities of the Lessee shall be corrected by the Lessee as directed by the said officer.

#### 26. TAXES

Any and all taxes imposed by the state or its political subdivisions upon the property or interest of the Lessee in the premises shall be paid promptly by the Lessee. If and to the extent that the property owned by the Government is

later made taxable by State or local governments under an Act of Congress, the lease shall be renegotiated.

#### 27. COVENANT AGAINST CONTINGENT FEES

The Lessee warrants that no person or selling agency has been employed or retained to solicit or secure this lease upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or established commercial or selling agencies maintained by the Lessee for the purpose of securing business. For breach or violation of this warranty, the United States shall have the right to annul this lease without liability or, in its discretion, to require the Lessee to pay, in addition to the lease rental or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

#### 28. OFFICIALS NOT TO BENEFIT

No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this lease or to any benefits to arise therefrom. However, nothing herein contained shall be construed to extend to any incorporated company if this lease is for the general benefit of such corporation or company.

#### 29. SEVERAL LESSEES

If more than one Lessee is named in this lease the obligations of said Lessees herein contained shall be joint and several obligations.

#### 30. MODIFICATIONS

This lease contains the entire agreement between the parties hereto, and no modification of this agreement, or waiver, or consent hereunder shall be valid unless the same be in writing, signed by the parties to be bound or by a duly authorized representative and this provision shall apply to this condition as well as all other conditions of this lease.

#### 31. DISCLAIMER

This lease is effective only insofar as the rights of the United States in the premises are concerned; and the Lessee shall obtain any permit or license which may be required by Federal, state, or local statute in connection with the use of the premises. It is understood that the granting of this lease does not preclude the necessity of obtaining a Department of the Army permit for activities which involve the discharge of dredge or fill material or the placement of fixed structures in the waters of the

United States, pursuant to the provisions of Section 10 of the Rivers and Harbors Act of 3 March 1899 (33 USC 403), and Section 404 of the Clean Waters Act (33 USC 1344).

#### ADDITIONAL CONDITIONS

32. Access to the leased premises will be granted in accordance with installation policy. Longhorn Army Ammunition Plant will issue picture badges to permanent Lessee management personnel. Other Lessee personnel will be granted access based upon a list of authorized personnel as provided by Lessee to the installation staff. The Lessee will be responsible to ensure that it's representatives, guests and visitors do not stray from the leased premises or designated ingress/egress routes.

33. Ingress and egress to and from the leased premises will be via the most direct route as approved by the Installation Commander's Representative. Due to the presence of explosives and contaminated sites on the installation, the Lessee and guests and representatives may not deviate from the approved ingress and egress routes and from the leased premises.

34. The Lessee will coordinate plans for scientific studies and research with the Installation Commander's Representative prior to implementation to ensure against conflicts in scheduled usage by both the Army and its contractors, and the Lessee.

35. There is a septic system on the Starr Ranch property. The Army is not aware of the present condition of this system. If the Lessee elects to use it, the Lessee will be responsible for repair or replacement of the system or providing an alternate sewage disposal/treatment system in accordance with applicable local standards and for obtaining any necessary operating permits.

36. If a telephone system is required, the Lessee will be responsible for obtaining a separate commercial system from that of the Government. The Army will provide any necessary easement.

37. The Army will continue to accomplish its approved, Natural Resources Management Program (NRMP) on the entire installation, to include the leased premises. The Installation Commander's Representative will coordinate with the Lessee to ensure that there is no conflict between the Lessee's interests and the Installation's NRMP and to ensure against conflicting schedules. The Installation's NRMP will

include controlled public hunting, controlled burning and non-commercial, selective tree removal. In conducting such activities under the NRMP, the Army will consider the conservation and biodiversity goals and objectives of the Ramsar Convention.

38. This lease is granted subject to all preceding and still existing contracts or use agreements affecting the leased premises, as listed in the Report of Availability. In particular, the parties recognize the ongoing natural resources study project being conducted by Sam Houston State University. The Lessee agrees to cooperate with Sam Houston State University in its use of the leased premises under the existing agreement with the Army.

39. The lease shall not be subject to revocation by the Secretary of the Army, except as provided for in this condition 39, provided that and so long as the Lessee's use of the property is consistent with the terms and conditions, and restrictions of the Lease. The Lease may be revoked by the Secretary, with the consent of the Lessee, to allow for an unencumbered disposal in accordance with the Federal Property and Administrative Services Act of 1949, as amended.

40. In accordance with 10 U.S.C. 2667(b)(2), the Lessee shall have the first right to buy the property upon a determination that the property is surplus and is to be sold in accordance with the procedures specified by the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 484) and applicable regulations. The first right to buy shall be exercised in accordance with applicable laws and regulations and any special terms and conditions that the Secretary or the Administrator of the General Services Administration deems to be in the best interests of the United States.

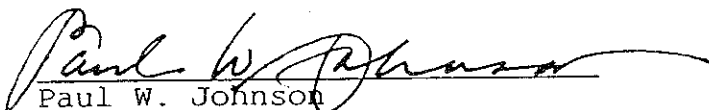
41. The Lessee shall not approach within 1250 feet of the area near the Harrison Bayou where a contractor currently produces explosives. This condition shall remain in effect until explosives production ceases. This requirement may be excepted on a case by case basis, when warranted, by the Installation Commander's Representative.

42. The Lessee shall not approach within 2400 feet of Burning Ground 3 during burning operations. The Lessee must coordinate its schedule with the Installation Commander's Representative to ensure no conflict in scheduled use of the area. In all cases, military use shall take precedence.

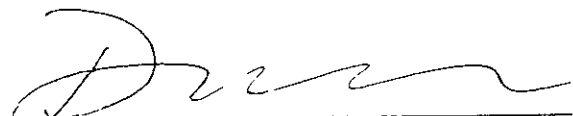
43. The Lessee, without further approval from the Secretary, may seek designation of the leased premises or portions thereof as a listed wetland of international importance, as provided for in Article 2 of the "Convention on Wetlands of International Importance especially as Waterfowl Habitat," Ramsar, 2.2.1971, as amended (hereinafter "Ramsar Treaty"). Any such designation must be based solely upon the Lessee's leasehold interest in the leased premises. The Secretary will cooperate with the Lessee in obtaining the designation. The Lessee will be solely responsible for compliance with any and all responsibilities or obligations arising out of designation of any portion of the leased premises under the Ramsar Treaty, including but not limited to the costs of any environmental monitoring, data collection, reporting, recordkeeping, and conservation and protection measures.

THIS LEASE is not subject to Title 10, United States Code, Section 2662, as amended.

IN WITNESS WHEREOF, I have hereunto set my hand by authority of the Secretary of the Army, this 4th day of October, 1996.

  
Paul W. Johnson  
Deputy Assistant Secretary  
(Installations and Housing)

THIS LEASE is also executed by the Lessee this 4th day of October, 1996.

  
Dwight K. Shellman Jr.  
President and General Counsel  
Caddo Lake Institute, Inc.



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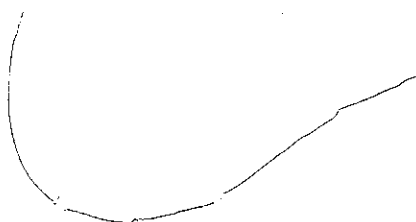
EXHIBIT A

032273



032274

EXHIBIT B



## MEMORANDUM OF AGREEMENT

## BETWEEN

CADDO LAKE INSTITUTE, INC. AND THE DEPARTMENT OF THE ARMY  
FOR A PROPOSED LEASE OF A PORTION OF  
LONGHORN ARMY AMMUNITION PLANT

WHEREAS: The United States is a signatory to the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, attachment 1, commonly known as the Ramsar Wetland Convention, because it was originally signed in Ramsar, Iran in 1971.

WHEREAS: Contracting parties to the Ramsar Wetland Convention shall, among other duties, designate suitable wetlands within their territory for inclusion in a List of Wetlands of International Importance (the List), formulate and implement planning so as to promote the conservation of wetlands included in the List, and as far as possible promote the wise, sustainable use of wetlands in their territories, encourage research regarding wetlands and their flora and fauna, and promote the training of personnel competent in the fields of wetland research, and management.

WHEREAS: The Caddo Lake Institute, Inc. (the Institute) is a private non-profit, operating foundation, whose purposes include the preservation and improvement of the ecological and cultural integrity of the Caddo Lake wetland ecosystem. The Institute's Ramsar-based projects include partnerships with federal and state agencies and with local schools and colleges which "field-train" local Master Wetland Science Educators, student wetland interns, and private landowners in world-class wetland science and stewardship skills. These projects include conducting local ecosystem research, monitoring and guidance in sustainable use. These activities are informed by, and seek to demonstrate the value of, the world-class wetland science guidance derived from the Ramsar Wetland Convention.

WHEREAS: Caddo Lake is a 26,000 acre wetland complex located on the border of Texas and Louisiana which drains the 6,000 square mile Cypress Bayou Basin and discharges these waters into the Red River and thence to the Gulf of Mexico. In 1993 the Institute joined the Texas Fish and Wildlife Department and the U.S. Department of Interior (DOI) in co-sponsoring the designation of a Texas-owned 6,500 acres Wildlife Management Area (WMA) within Caddo Lake's wetlands as the 14th U.S. Ramsar Wetland of international importance.

WHEREAS: Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas, a Department of the Army installation, lies in close proximity to the Caddo Lake Ramsar lands, and contains important, biologically diverse shoreline, wetlands, bottom land hardwood and upland forests, particularly a portion known as Harrison Bayou bottom land, as well as other diverse and significant biological species, communities, habitats, and water resources.

WHEREAS: In 1996 the United States government invited the Caddo Lake Institute to join in formulating a pledge to be made at the 6th Conference of the Ramsar Contracting Parties to be held in Brisbane, Australia. The Institute's initiative included a commitment of \$100,000 to stimulate the establishment of the first U.S. Regional Ramsar Center at Caddo Lake. The Institute's private sector initiative was included as a part of the official United States pledge announced as part of the March 1996 25th anniversary Brisbane ceremonies celebrating the signing of the Ramsar Wetland Convention.

WHEREAS: The Institute desires to conduct an awards ceremony in October 1996 which will honor the many government and private persons who have helped place important parts of the Caddo Lake ecosystem under sustainable stewardship consistent with the Ramsar Wetlands Convention, and to announce the inclusion of important portions of LHAAP under such stewardship management.

WHEREAS: The Army supports the purposes and goals of the Ramsar Wetland Convention and the Institute's efforts on behalf of the United States under the Convention.

NOW THEREFORE AND IN FURTHERANCE OF THE PREMISES AND GOALS SET FORTH ABOVE, the parties agree as follows:

1. Should the Institute desire to hold an awards ceremony on LHAAP, the Army agrees to grant the Institute a right of entry to prepare for and conduct such a ceremony, open to invitees and the public, subject to terms and conditions that the Army deems appropriate. The right of entry shall also grant the Institute access for the purpose of conducting assessments and delineations necessary to prepare long term lease documentation.
2. The Army proposes and currently intends to grant, as soon as practicable, a long term lease to the Institute, under 10 U.S.C. §2667, to certain portions of LHAAP, consistent with and subject to compliance with all federal laws and Executive Orders, including but not limited to, the National Environmental Policy Act, the National Historic Preservation Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Clean Water Act, the Endangered Species Act, the McKinney Act, the Sikes Act, and Executive Order 11988 Floodplain Management, Executive Order 11990 Protection of Wetlands, and Executive Order 13007 Indian Sacred Sites.
  - a. Parcel Description: The lease, initially, will include two parcels of land, broadly described herein as all of LHAAP Woodland Management Units 11 and 12, including the Starr Ranch improvements, and the Harrison Bayou natural area, lying generally within LHAAP Woodland Management Units 13, 32, 33, 35, 36, 38, 39, and 40, to be more fully and accurately described in the lease. To the maximum extent possible, areas of known contamination or Army remediation sites shall be excepted and excluded from the parcels to be leased to the Institute.

b. **Purposes of Lease:** The lease shall restrict the Institute to uses that do not involve construction, alteration of facilities or resources, land disturbance, or activities of any kind that have a significant impact on the environment and which can be supported by a Categorical Exclusion under Army Regulation 200-2 for compliance with the National Environmental Policy Act. The purpose of the lease will be to promote development (with academic, institutional and other agencies) of projects which will assure the long-term continuation, maintenance or improvement of the area's rich and diverse cultural, biological and ecological values, functions, training and demonstration opportunities. Use by the Institute shall be consistent with and complimentary to the LHAAP Natural Resource Management Plan and the Department of the Army's conservation and stewardship responsibilities under Federal law. The Parties may in the future amend the lease to permit additional uses, including uses consistent with the recitals of this Agreement, to include potentially the construction of buildings, roads, and other improvements, or the use or modification of existing structures, or other uses, subject to compliance with all federal laws and Executive Orders.

c. **Term of the Lease:** The lease shall be for a term of thirty (30) years.

d. **Existing Army Buildings:** The lease will provide that the Institute will not alter, modify, demolish, or otherwise make changes to the existing Army buildings, located on Starr Ranch, without receiving prior written approval from the Army. The Institute will be required to maintain these structures throughout the duration of the lease, preserving any historical or architectural value as stipulated in the lease.

e. **Compliance with Law:** The lease will require that the Institute's activities and use of the leased premises shall comply with all applicable federal, state, and local laws and regulations, including applicable and appropriate Army regulations.

f. **Fines and Penalties:** The lease will require that any fines, penalties and/or remediation costs resulting from the Institute's activities shall be the sole responsibility of the Institute, and should the Army be required to pay any fines, penalties, or remediation costs arising from activities caused solely by the Institute, the Institute shall agree to reimburse the Army the amount of any such fine, penalty, or remediation cost.

g. **Rental Value:** The rental value for the leased premises shall be Fair Market Value (FMV) based on uses permitted by the lease. If the parties cannot agree on an acceptable FMV for the leased premises, the FMV shall be established by a mutually agreeable outside professional appraisal, the cost of the appraisal to be paid by the Institute. It is agreed that the lease may, consistent with 10 U.S.C. § 2667, provide for a full or partial rental offset credit for costs incurred by the Institute for the improvement, maintenance, protection, repair, or restoration of the leased premises.

h. **Utilities:** The Institute shall agree to pay the cost of any utilities supplied by the Army in accordance with Army regulations and procedures.



i. Non-interference with Army IRP: The lease shall provide that all uses by the Institute shall be subject to, consistent with, and not in conflict with the Army's Installation Restoration Program (IRP), and the Institute will agree to grant the Army and appropriate federal and state environmental regulatory agencies, access to and permission to conduct any necessary IRP projects or to collect environmental data on the leased premises.

j. Liability for Existing Contamination: The lease shall provide that the Institute shall not be responsible for any remediation costs or liability arising solely from contamination existing on or migrating onto the leased premises arising from activities of the United States Army, its contractors, lessees, or other parties not under the control of the Institute.

k. Preliminary Assessment Screening: The Institute will provide the Army with a Preliminary Assessment Screening (PAS) for Army review and approval for the lease.

l. Revocation of the Lease: So long as the Institute's use of the premises is consistent with the lease, and its terms and conditions, including the use restrictions, it is agreed that the lease shall not be subject to revocation by the Secretary of the Army, the purpose thereof having been determined to be in the public interest.

m. The lease shall contain such other terms and conditions as the Secretary of the Army determines to be in the best interest of the United States.

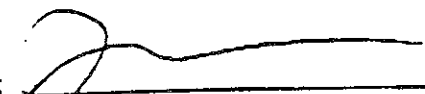
3. This Memorandum of Agreement expresses the intent of the parties to enter into a lease for a portion of LHAAP, consistent with the requirements of Federal law. It is agreed that any sums expended by the Institute in anticipation of the execution of such a lease are expended at its sole risk, and create no right to any claim against the Army or the United States.

IN WITNESS WHEREOF, the parties have signed and executed this Memorandum of Agreement set forth herein, to be effective as of the date of the last signature.

DEPARTMENT OF THE ARMY

THE CADDO LAKE INSTITUTE, INC.

By:   
P. W. Johnson  
Deputy Assistant Secretary of the Army  
(Installations and Housing)

By:   
Dwight K. Shellman, Jr.  
President and General Counsel

Date: 9/20/96

Date: 9/18/96

Convention on Wetlands of International Importance  
especially as Waterfowl Habitat

Ramsar, 2.2.1971  
as amended by the Protocol of 3.12.1982  
and the Amendments of 21.5.1987

Certified copy

Paris, 13 July 1994.

Director, Office of International Standards and Legal Affairs  
United Nations Educational, Scientific and Cultural Organization (UNESCO)

*Ji. Fontanelli*



*Attachment 1*

Ramsar, 22.1971

as amended by the Paris Protocol of 3.12.1982  
and the Regina Amendments of 28.9.1987

# The Contracting Parties.

Recognizing the interdependence of Man and his environment;

Considering the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna, especially waterfowl;

Being convinced that wetlands constitute a resource of great economic, cultural, scientific, and recreational value, the loss of which would be irreparable;

Desiring to stem the progressive encroachment on and loss of wetlands now and in the future;

Recognizing that waterfowl in their seasonal migrations may transcend frontiers and so should be regarded as an international resource;

Being confident that the conservation of wetlands and their flora and fauna can be ensured by combining far-sighted national policies with co-ordinated international action;

Have agreed as follows:

## Article 1

1. For the purpose of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.
2. For the purpose of this Convention waterfowl are birds ecologically dependent on wetlands.

## Article 2

1. Each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, hereinafter referred to as "the List" which is maintained by the Bureau established under Article 8. The boundaries of each wetland shall be precisely described and also delimited on a map and they may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands, especially where these have importance as waterfowl habitat.
2. Wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology. In the first instance wetlands of international importance to waterfowl at any season should be included.
3. The inclusion of a wetland in the List does not prejudice the exclusive sovereign rights of the Contracting Party in whose territory the wetland is situated.
4. Each Contracting Party shall designate at least one wetland to be included in the List when signing this Convention or when depositing its instrument of ratification or accession, as provided in Article 9.
5. Any Contracting Party shall have the right to add to the List further wetlands situated within its territory, to extend the boundaries of those wetlands already included by it in the List, or, because of its urgent national interests, to delete or restrict the boundaries of wetlands already included by it in the List and shall, at the earliest possible time, inform the organization or government responsible for the continuing Bureau duties specified in Article 8 of any such changes.
6. Each Contracting Party shall consider its international responsibilities for the conservation, management and wise use of migratory stocks of waterfowl, both when designating entries for the List and when exercising its right to change entries in the List.

## Article 3

1. The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.
2. Each Contracting Party shall arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organization or government responsible for the continuing Bureau duties specified in Article 8.

## Article 4

1. Each Contracting Party shall promote the conservation of wetlands and waterfowl by establishing nature reserves on wetlands, whether they are included in the List or not, and provide adequately for their wardening.
2. Where a Contracting Party in its urgent national interest, deletes or restricts the boundaries of a wetland included in the List, it should as far as possible compensate for any loss of wetland resources, and in particular it should create additional nature reserves for waterfowl and for the protection, either in the same area or elsewhere, of an adequate portion of the original habitat.
3. The Contracting Parties shall encourage research and the exchange of data and publications regarding wetlands and their flora and fauna.
4. The Contracting Parties shall endeavour through management to increase waterfowl populations on appropriate wetlands.
5. The Contracting Parties shall promote the training of personnel competent in the fields of wetland research, management and wardening.

## Article 5

The Contracting Parties shall consult with each other about implementing obligations arising from the Convention especially in the case of a wetland extending over the territories of more than one Contracting Party or where a water system is shared by Contracting Parties. They shall at the same time endeavour to co-ordinate and support present and future policies and regulations concerning the conservation of wetlands and their flora and fauna.

## Article 6

1. There shall be established a Conference of the Contracting Parties to review and promote the implementation of this Convention. The Bureau referred to in Article 8, paragraph 1, shall convene ordinary meetings of the Conference of the Contracting Parties at intervals of not more than three years, unless the Conference decides otherwise, and extraordinary meetings at the written request of at least one third of the Contracting Parties. Each ordinary meeting of the Conference of the Contracting Parties shall determine the date and venue of the next ordinary meeting.
2. The Conference of the Contracting Parties shall be competent:
  - (a) to discuss the implementation of this Convention;
  - (b) to discuss additions to and changes in the List;
  - (c) to consider information regarding changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;
  - (d) to make general or specific recommendations to the Contracting Parties regarding the conservation, management and wise use of wetlands and their flora and fauna;
  - (e) to request relevant international bodies to prepare reports and statistics on matters which are essentially international in character affecting wetlands;
  - (f) to adopt other recommendations, or resolutions, to promote the functioning of this Convention.

revers for wetlands management shall be informed of, and take into consideration, recommendations of the Conferences concerning the conservation, management, and use of wetlands and their flora and fauna.

4. The Conference of the Contracting Parties shall adopt rules of procedure for each of its meetings.
5. The Conference of the Contracting Parties shall establish and keep under review the financial regulations of this Convention. At each of its ordinary meetings, it shall adopt the budget for the next financial period by a two-thirds majority of Contracting Parties present and voting.
6. Each Contracting Party shall contribute to the budget according to a scale of contributions adopted by unanimity of the Contracting Parties present and voting at a meeting of the ordinary Conference of the Contracting Parties.

#### Article 7

1. The representatives of the Contracting Parties at such Conferences should include persons who are experts on wetlands or waterfowl by reason of knowledge and experience gained in scientific, administrative or other appropriate capacities.
2. Each of the Contracting Parties represented at a Conference shall have one vote. Recommendations, resolutions and decisions being adopted by a simple majority of the Contracting Parties present and voting, unless otherwise provided for in this Convention.

#### Article 8

1. The International Union for Conservation of Nature and Natural Resources shall perform the continuing bureau duties under this Convention until such time as another organization or government is appointed by a majority of two-thirds of all Contracting Parties.
2. The continuing bureau duties shall be, *inter alia*:
  - (a) to assist in the convening and organizing of Conferences specified in Article 6;
  - (b) to maintain the List of Wetlands of International Importance and to be informed by the Contracting Parties of any additions, extensions, deletions or restrictions concerning wetlands included in the List provided in accordance with paragraph 3 of Article 2;
  - (c) to be informed by the Contracting Parties of any changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;
  - (d) to forward notification of any alterations to the List, or changes in character of wetlands included therein, to all Contracting Parties and to arrange for these matters to be discussed at the next Conference;
  - (e) to make known to the Contracting Party concerned, the recommendations of the Conferences in respect of such alterations to the List or of changes in the character of wetlands included therein.

#### Article 9

1. This Convention shall remain open for signature indefinitely.
2. Any member of the United Nations or of one of the Specialized Agencies or of the International Atomic Energy Agency or Party to the Statute of the International Court of Justice may become a Party to this Convention by:
  - (a) signature without reservation as to ratification;
  - (b) signature subject to ratification followed by ratification;
  - (c) accession.
3. Ratification or accession shall be effected by the deposit of an instrument of ratification or accession with the Director-General of the United Nations Educational, Scientific and Cultural Organization (hereinafter referred to as "the Depositary").

1. This Convention shall enter into force four months after seven States have become Parties to this Convention in accordance with paragraph 2 of Article 9.

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2. Thereafter this Convention shall enter into force for each Contracting Party four months after the day of its signature without reservation as to ratification, or its deposit of an instrument of ratification or accession.

#### Article 10 bis

1. This Convention may be amended at a meeting of the Contracting Parties convened for that purpose in accordance with this article.
2. Proposals for amendment may be made by any Contracting Party.
3. The text of any proposed amendment and the reasons for it shall be communicated to the organization or government performing the continuing bureau duties under the Convention (hereinafter referred to as "the Bureau") and shall promptly be communicated by the Bureau to all Contracting Parties. Any comments on the text by the Contracting Parties shall be communicated to the Bureau within three months of the date on which the amendments were communicated to the Contracting Parties by the Bureau. The Bureau shall immediately after the last day for submission of comments, communicate to the Contracting Parties all comments submitted by that day.
4. A meeting of Contracting Parties to consider an amendment communicated in accordance with paragraph 3 shall be convened by the Bureau upon the written request of one third of the Contracting Parties. The Bureau shall consult the Parties concerning the time and venue of the meeting.
5. Amendments shall be adopted by a two-thirds majority of the Contracting Parties present and voting.
6. An amendment adopted shall enter into force for the Contracting Parties which have accepted it on the first day of the fourth month following the date on which two thirds of the Contracting Parties have deposited an instrument of acceptance with the Depositary. For each Contracting Party which deposits an instrument of acceptance after the date on which two thirds of the Contracting Parties have deposited an instrument of acceptance, the amendment shall come into force on the first day of the fourth month following the date of the deposit of its instrument of acceptance.

#### Article 11

1. This Convention shall continue in force for an indefinite period.
2. Any Contracting Party may denounce this Convention after a period of five years from the date on which it entered into force for that Party by giving written notice thereof to the Depositary. Denunciation shall take effect four months after the day on which notice thereof is received by the Depositary.

#### Article 12

1. The Depositary shall inform all States that have signed and acceded to this Convention as soon as possible of:
  - (a) signatures to the Convention;
  - (b) deposits of instruments of ratification of this Convention;
  - (c) deposits of instruments of accession to this Convention;
  - (d) the date of entry into force of this Convention;
  - (e) notifications of denunciation of this Convention.
2. When this Convention has entered into force, the Depositary shall have it registered with the Secretariat of the United Nations in accordance with Article 102 of the Charter.

IN WITNESS WHEREOF, the undersigned, being duly authorized to that effect, have signed this Convention.

DONE at Ramat, this 2nd day of February 1971, in a single original in the English, French, German and Russian languages, all texts being equally authentic\* which shall be deposited with the Depositary which shall send true copies thereof to all Contracting Parties.

\* Pursuant to the Final Act of the Conference to conclude the Protocol, the Depositary furnished the signed Conferences of the Contracting Parties with a copy of the text in each of the four languages.

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EXHIBIT C

## JOINT SURVEY AND INSPECTION OF CONDITION OF GOVERNMENT LEASED PROPERTY

## INSTRUCTIONS

1. If considered necessary, use a separate ENG Form 3143a for each room surveyed.

2. Additional sheets may be attached for physical characteristics of land and buildings: exterior

and interior details of buildings; service facilities; inventory of machinery and equipment; miscellaneous items and general remarks not otherwise covered in section II of this form or on ENG Form 3143a.

ADDED INSTRUCTIONS (Overprint, if desired)

## SECTION I - PROPERTY DATA AND CONDITION AGREEMENT

|                |           |                                          |                       |
|----------------|-----------|------------------------------------------|-----------------------|
| DATE OF SURVEY | LEASE NO. | LEASE COMMENCEMENT DATE                  | DATE POSSESSION TAKEN |
|                |           |                                          |                       |
| ACTIVITY       |           | TOTAL LEASED BUILDING AREA (Square feet) |                       |
|                |           |                                          |                       |

## DESCRIPTION AND LOCATION OF PROPERTY

Building Identification No. 99Y

Square footage of building 1565

Condition of the facilities - Starr Ranch is a wood frame cabin built in 1956 with rock siding, metal roof, screened-in porch, no foundation (elevated on wooden piers), located on a peninsular adjacent to Caddo Lake. The building has electrical and telephone lines, but both services have been disconnected. The building has no potable water. It has an old septic system, the condition of which is unknown. It has a detached kitchen connected by a covered walkway. The building is deteriorated due to years of neglect and total lack of maintenance, but appears weather-tight and could be restored to useable condition with minimal effort.

Condition of the facilities Facility TS-12 is a detached Barbeque Grill; 4'x8', transite siding on three sides and on the roof, concrete slab. The facility appears to be permanent construction in a very usable condition.

Facility 98Y is a concrete boat ramp in usable condition.

## JOINT AGREEMENT ON THE CONDITION OF THE PROPERTY

We, the undersigned, jointly made a survey and inspection of the condition of the property mentioned above. We agree that as of the date of survey, the condition of the property is as described herein.

|                                                                                                                                                        |  |                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------|
| THE CONDITION OF THE EXTERIOR OF THE PROPERTY IS INDICATED ON THE REVERSE SIDE OF THIS FORM. ROOM CONDITIONS ARE INDICATED ON ATTACHED ENG FORM 3143a. |  | NO. OF ATTACHMENTS                                           |
| NAME AND SIGNATURE OF <input type="checkbox"/> OWNER <input type="checkbox"/> LESSOR/LESSEE                                                            |  | NAME, TITLE, AND SIGNATURE OF U.S. GOVERNMENT REPRESENTATIVE |
| <input type="checkbox"/> AGENT<br>CADDIS LAKE INSTITUTE, INC<br>by <i>[Signature]</i> President                                                        |  | LYNN MUCKELBATH - ENVIRONMENTAL SU<br><i>[Signature]</i>     |
| ADDRESS<br>P.O. Box 2710<br>Aspen CO 81612                                                                                                             |  | ORGANIZATION<br>SIOUX - OR                                   |



BLDG. 99Y

## SECTION II - EXTERIOR CONDITION OF THE PROPERTY (Attach sheet for added items.)

GUTTER, EAVES, DOWNSPOUTS, ETC.

ROOF IS GALVANIZED METAL OVER ASPHALT SHINGLES - FAIR CONDITION WITH NO OBVIOUS LEAKS INSIDE BLDG.  
EAVES HAVE BADLY PEELING PAINT WITH DECAY ON SEVERAL BOARDS

WALLS - PRIMARILY NATIVE IRON ORE ROCK WITH NO OBVIOUS DEFECTS  
ONE SECTION HAS WOOD SIDING ON UPPER PORTION, BAD PAINT WITH DECAY ON SEVERAL BOARDS.

WINDOWS AND DOORS (Include storm windows and doors)

PRIMARILY WOOD FRAMED. DECAY AROUND WINDOWS WITH AIR  
CONDITIONING UNITS

FENCING

NONE

LAWN, SHRUBBERY, TREES AND PERENNIALS

NATIVE GRASS LAWN. TWO LARGE CEDAR TREES ADJACENT

WALKS AND DRIVEWAYS

GRAVEL DRIVE

GARAGE AND OUT BUILDINGS

NO GARAGE. THERE IS A SMALL (10FT X 12FT) OUT BUILDING  
CONNECTED BY COVERED WALKWAY. THIS IS WOOD LAP SIDING WITH SOME  
DECAYED BOARDS AND PEELING PAINT.

ENTRANCES, ELEVATORS AND PATIOS

NONE

SEWAGE

SEPTIC TANK - CONDITION UNKNOWN  
AN ELEVATED CISTERN TANK BEHIND OUT BUILDING  
COLLECTS RAIN WATER FOR RESTROOM.

REMARKS (Include questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

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JOINT SURVEY AND INSPECTION OF CONDITION OF GOVERNMENT LEASED PROPERTY.  
SECTION III—INTERIOR CONDITION OF INDIVIDUAL ROOM

(Use reverse side for added items and remarks on questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

|                                                                                                           |                                |           |          |
|-----------------------------------------------------------------------------------------------------------|--------------------------------|-----------|----------|
| LEASE NO.                                                                                                 | TYPE OF ROOM<br>SCREENED PORCH | FLOOR NO. | ROOM NO. |
| FLOOR AND FLOOR COVERING (Include stairways and stair covering)<br>FLOOR - WOOD, SOUND, NEEDS REFINISHING |                                |           |          |
| WALLS<br>PRIMARYLY SCREENED WITH WOOD BASE AND FRAMES.<br>3 SECTIONS 2 FT X 4 FT NEED REPLACING.          |                                |           |          |
| CEILING<br>WOOD - SOUND NEEDS PAINTING                                                                    |                                |           |          |
| DOORS AND WINDOWS (Include skylights and other openings)<br>SCREEN DOOR - FAIR                            |                                |           |          |
| PLUMBING (Include pipes, toilets and lavatories, drinking fountains, etc.)<br>NONE                        |                                |           |          |
| ELECTRICAL FIXTURES<br>INCANDESCENT FIXTURES - UNKNOWN CONDITION                                          |                                |           |          |
| HEATING (Include radiators, thermostats, etc.)<br>NONE                                                    |                                |           |          |
| WOODWORK (Include trim and baseboard, and hallways)<br>WOOD                                               |                                |           |          |
| OTHER EQUIPMENT (Include stove, refrigerator, washer, dryer, etc.)                                        |                                |           |          |

BLDG. 99Y

JOINT SURVEY AND INSPECTION OF CONDITION OF GOVERNMENT LEASED PROPERTY.  
SECTION III—INTERIOR CONDITION OF INDIVIDUAL ROOM

(Use reverse side for added items and remarks on questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

|                                                                                                                                   |                         |           |          |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|----------|
| LEASE NO.                                                                                                                         | TYPE OF ROOM<br>MEETING | FLOOR NO. | ROOM NO. |
| FLOOR AND FLOOR COVERING (Include stairways and stair covering)<br>FLOOR - WOOD, SOUND BUT NEEDS REFINISHING<br>APPROX. 18' X 21' |                         |           |          |
| WALLS<br>PINE PANELING - GOOD                                                                                                     |                         |           |          |
| CEILING<br>PINE PANELING - GOOD                                                                                                   |                         |           |          |
| DOORS AND WINDOWS (Include skylights and other openings)<br>DOORS - SOUND NEEDS FINISHING<br>WINDOWS - SOUND 2 PANES BROKEN       |                         |           |          |
| PLUMBING (Include pipes, toilets and lavatories, drinking fountains, etc.)<br>NONE                                                |                         |           |          |
| ELECTRICAL FIXTURES<br>3 FLORESCENT FIXTURES - 2 BULBS EACH 48"                                                                   |                         |           |          |
| HEATING (Include radiators, thermostats, etc.)<br>4 FORCED AIR ELECTRIC HEATERS<br>1 WINDOW AC                                    |                         |           |          |
| WOODWORK (Include trim and baseboard, and hallways)<br>ALL WOOD HEAVY PINE                                                        |                         |           |          |
| OTHER EQUIPMENT (Include stove, refrigerator, washer, dryer, etc.)<br>FIRE PLACE - HEARTH IS CONCRETE (NEEDS REPLACEMENT)         |                         |           |          |

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JOINT SURVEY AND INSPECTION OF CONDITION OF GOVERNMENT LEASED PROPERTY.  
SECTION III—INTERIOR CONDITION OF INDIVIDUAL ROOM

(Use reverse side for added items and remarks on questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

|                                                                                                                                                                                        |                            |           |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------|----------|
| LEASE NO.                                                                                                                                                                              | TYPE OF ROOM<br>BEDROOM #1 | FLOOR NO. | ROOM NO. |
| FLOOR AND FLOOR COVERING (Include stairways and stair covering)<br>WOOD FLOOR - SOUND.<br>APPROX 14' X 18'                                                                             |                            |           |          |
| WALLS<br>FIBER BOARD - SOUND                                                                                                                                                           |                            |           |          |
| CEILING<br>FIBER BOARD - SOUND                                                                                                                                                         |                            |           |          |
| DOORS AND WINDOWS (Include skylights and other openings)<br>1 DOOR TO MEETING ROOM - GOOD<br>1 DOOR TO OUTSIDE WALKWAY - FAIR<br>2 FRENCH DOORS TO BEDROOM #2 - GOOD                   |                            |           |          |
| PLUMBING (Include pipes, toilets and lavatories, drinking fountains, etc.)<br>1 BATHROOM WITH LINOLEUM FLOOR APPROX. 5' X 8'<br>COMMODE & SINK - STAINED BADLY<br>PLASTIC SHOWER STALL |                            |           |          |
| ELECTRICAL FIXTURES<br>1 FLORES. FIXTURE & BULB - CONDITION UNKNOWN<br>1 WINDOW AC - UNKNOWN CONDITION                                                                                 |                            |           |          |
| HEATING (Include radiators, thermostats, etc.)<br>2 FORCED AIR ELECTRIC HEATERS                                                                                                        |                            |           |          |
| WOODWORK (Include trim and baseboard, and hallways)<br>WOOD                                                                                                                            |                            |           |          |
| OTHER EQUIPMENT (Include stove, refrigerator, washer, dryer, etc.)                                                                                                                     |                            |           |          |

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JOINT SURVEY AND INSPECTION OF CONDITION OF GOVERNMENT LEASED PROPERTY.  
SECTION III—INTERIOR CONDITION OF INDIVIDUAL ROOM

(Use reverse side for added items and remarks on questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

|                                                                                                                                              |                            |           |          |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------|----------|
| LEASE NO.                                                                                                                                    | TYPE OF ROOM<br>BEDROOM #2 | FLOOR NO. | ROOM NO. |
| FLOOR AND FLOOR COVERING (Include stairways and stair covering)<br>WOOD FLOOR - SOUND - PAINTED<br>APPROX. 9' X 14"                          |                            |           |          |
| WALLS<br>PLYWOOD / PAINTED - SOUND NEEDS PAINTING                                                                                            |                            |           |          |
| CEILING<br>SAME AS WALLS                                                                                                                     |                            |           |          |
| DOORS AND WINDOWS (Include skylights and other openings)<br>SLIDING, ALUMINUM FRAME, AROUND TOTAL ROOM<br>SOUND CONDITION (1 WINDOW CRACKED) |                            |           |          |
| PLUMBING (Include pipes, toilets and lavatories, drinking fountains, etc.)<br>NONE                                                           |                            |           |          |
| ELECTRICAL FIXTURES<br>1 FLUORESC. FIX. APPEARS IN GOOD CONDITION                                                                            |                            |           |          |
| HEATING (Include radiators, thermostats, etc.)<br>UNKNOWN                                                                                    |                            |           |          |
| WOODWORK (Include trim and baseboard, and hallways)<br>WOOD - PAINTED                                                                        |                            |           |          |
| OTHER EQUIPMENT (Include stove, refrigerator, washer, dryer, etc.)                                                                           |                            |           |          |

U.S. Government Printing Office: 1979-828-112

BLDG. T S-12

## SECTION II - EXTERIOR CONDITION OF THE PROPERTY (Attach sheet for added items.)

ROOF, EAVES, DOWNSPOUTS, ETC.

A DETACHED BARBEQUE GRILL SHED. TRANSITE  
SIDING ON THREE SIDES AND ROOF ON CONCRETE SLAB.  
BRICK BASE WITH METAL COVER.

WALLS

WINDOWS AND DOORS (Include storm windows and doors)

FENCING

LAWN, SHRUBBERY, TREES AND PERENNIALS

WALKS AND DRIVEWAYS

GARAGE AND OUT BUILDINGS

ENTRANCES, ELEVATORS AND PATIOS

SEWAGE

REMARKS (Include questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)



BLDG. 98Y

## SECTION II - EXTERIOR CONDITION OF THE PROPERTY (Attach sheet for added items.)

RIPS, EAVES, DOWNSPOUTS, ETC.

NONE

WALLS

CONCRETE WALLED BOAT RAMP WITH WOODEN MOVABLE  
RAMP. IN USABLE CONDITION

WINDOWS AND DOORS (Include storm windows and doors)

FENCING

LAWN, SHRUBBERY, TREES AND PERENNIALS

WALKS AND DRIVEWAYS

GARAGE AND OUT BUILDINGS

ENTRANCES, ELEVATORS AND PATIOS

SEWAGE

REMARKS (Include questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

032291



REPLY TO  
ATTENTION OF:

DEPARTMENT OF THE ARMY  
FORT WORTH DISTRICT, CORPS OF ENGINEERS  
P. O. BOX 17300  
FORT WORTH, TEXAS 76102-0300

June 30, 2003

99  
AHRENS/ja/1106  
Reader M MD

CESWF-RE-MD

SUBJECT: Caddo Lake Institute Lease DACA63-1-97-0501, Longhorn Army Ammunition Plant, Texas

Caddo Lake Institute, Incorporated  
ATTN: Mr. Dwight Shellman  
P.O. Box 2710  
Aspen, Colorado 81612

Dear Mr. Shellman:

This letter is to formally notify you that a Final Report of Excess for 8,492.02 acres at Longhorn Army Ammunition Plant (LHAAP), Texas, was sent to GSA on July 26, 2002. In a Memorandum of Agreement dated October 21, 2000, 7,172 acres of the 8,492.02 acres were placed by Department of Army and Department of Interior, Fish and Wildlife Service (Service) into a overlay wildlife refuge status, which gave the Service secondary jurisdiction over those lands. GSA is to transfer the land and the Service has indicated an interest in receiving a portion of the clean property.

The remainder of the land not taken by the Service will be disposed of under GSA's normal disposal process. In July 1998 the House Armed Service Committee approved the Title 10 report submitted on LHAAP. This report determined LHAAP to be a candidate for early transfer under Section 120(h)(3)(C) of CERCLA (42 U.S.C. 9620(h)(3)(c)).

Sincerely,

Hyla J. Head  
Chief, Real Estate Division

S C  
CABELLO

WYATT *art*

KLUTZ *ll*

CAMP *BC*

HEAD *HJ*

MAIL 7-3-03  
RE FILES

# **ATTACHMENT 4**

ECOP - DOA HAS

**Murray, Cliff SWT**

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**From:** Murray, Cliff SWT  
**Sent:** Tuesday, May 18, 2004 11:43 AM  
**To:** Wilma Subra (SubraCom@aol.com); Barry Forsythe (forsythe.barry@epa.gov); Laura M. Benneyworth (Benneyworth, Laura M LRN); Chris Villarreal (villarreal.chris@epamail.epa.gov); Craig Gigglesman (craig\_gigglesman@fws.gov); James Sher (JSHER@tnrcc.state.tx.us); Jeff Armstrong (Jeffrey.Armstrong@aec.apgea.army.mil); Kristy Mauricio (KMaurici@tnrcc.state.tx.us); Paul Bruckwicki (paul\_bruckwicki@fws.gov); Praveen Srivastav (Praveen.Srivastav@shawgrp.com); Rose M Zeiler (zeilerr@sill.army.mil); Tom Erny (terny@tnrcc.state.tx.us)  
**Subject:** May 2004 Longhorn Manager's Meeting -Phone Conference

We have scheduled a phone conference for the monthly manager's meeting for this Wednesday, 19 May 2004 at 9 am.

Attached are pdf files of handouts for this meeting. Minutes from the manager's meeting held 21 April 2004 will be forwarded to you later today.

The agenda for this phone conference is:

1. Document review status
2. Sampling proposed for Site 32
3. Update on evaluation of data from Site 45, western further investigation area, and the warehouse area
4. Update on regulatory comments on the installation-wide BERA
5. Quarterly sampling results
6. UXO training after TRC meeting



LHAAP



LHAAP

Sampling Summaries Status 5

Cliff-Murray  
Tulsa District Corps of Engineers  
CESWT-EC-ER  
918-669-7573  
918-669-4317 (fax)  
Cliff.Murray@usace.army.mil



---

**Subject: Draft Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting: Via Conference Call**

**Date of Meeting: May 19, 2004 9:00 – 10:00 AM**

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**Meeting Participants:**

**BRAC:** Rose M. Zeiler

**USAEC:** Jeff Armstrong

**USACE-Tulsa:** Cliff Murray, Susan Trussell

**USACE-Nashville:** Laura Benneyworth

**Shaw Environmental:** Praveen Srivastav, Kay Everett, Frank Eidson

**USEPA Region 6:** Chris Villarreal

**TCEQ:** Jim Sher, Kristian Mauricio

**TAPP:** Wilma Subra

---

**Document Review Status**

Praveen Srivastav, Shaw, began the meeting by discussing the status of the technical documents as shown in the table entitled "Status of Technical Documents" that was provided previously via electronic mail. Susan Trussell stated that although no substantive changes were made to the ECOP document submitted April 29, 2004, a reissue of the ECOP document will be made sometime later this week with an amendment letter and replacement pages attached. A complete PDF will be available at that time.

Comments from TCEQ on Site 12 will be provided soon. Jim Sher, TCEQ, said the comments were minor.

**Sampling Proposed for Site 32**

Rose Zeiler, BRAC, said that the Army would need to identify the limits of the contaminated area by conducting additional soil sampling and also sample groundwater. Jeff Armstrong, USAEC, indicated that sampling of wells and collection of soil samples needs to be done. Jeff did not see a long delay in getting the funding out and thought that a month from now would be at the longest. Rose Zeiler and Praveen Srivastav commented that the schedule for Site 32 would be impacted even with funding being available in June.

Jim Sher, TCEQ, said he is waiting for some communication on the proposed classification of the contaminated soil waste at Site 32 if it is excavated. Rose Zeiler stated that this issue would be addressed soon. Praveen Srivastav clarified that a set of borings would be installed to the top of the water table and would probably be about 5-6 borings with three soil samples collected from each boring, and a temporary well installed at a previously identified higher concentration location to determine if leaching might be occurring.

#### **Data Evaluation**

Cliff Murray, USACE, said that Site 45 would be reevaluated for transfer with an expanded dataset. That exercise also includes the warehouse area near the northeast corner of the installation. The plan is to use data from the USACHPPM and USFWS reports. Funding for this task is available and an RFP has been issued to Shaw.

Funding for Site 49 is still not identified. Site 49 was described as a DSERT site and was to be evaluated along with Site 29 and 32 as part of Group 2, but it was not.

#### **Update on Regulatory Comments on the Installation-Wide BERA**

Rose Zeiler informed the team that this issue is currently being worked on.

#### **Site 12 Feasibility Study**

Jim Sher said that the Site 12 FS did not include language for specific institutional control measures and he stressed the need for it to be addressed. He emphasized that no further action is based on industrial usage and that, since the waste is still in place, there is should be deed restrictions to keep the material from being removed.

Rose Zeiler said there are no army guidelines and they are to follow Navy guidelines. Jeff Armstrong said he has a draft Army's guidance and an EPA Region 4 checklist that he can send to Rose Zeiler. Jim Sher said he needed his lawyer and others in his office to look at the institutional controls language before anything could be approved. Rose Zeiler suggested that the institutional controls issue could be discussed at the TRC meeting in June.

#### **Quarterly Sampling Results**

Cliff Murray presented results of the quarterly sampling. Jim Sher expressed appreciation to USACE for the quick response in providing the sampling results. (Hand out previously provided by electronic mail.) He did want to discuss further the perchlorate detection limit issue. Jim said the "J" qualified data should not be ignored and should be reported. Chris Villarreal, EPA, stated that Method 314 is being modified (Method 314.1) and should be out in about a month. . There are lots of false positives found using Method 314, but a spike can be run to resolve the false positives.

Rose Zeiler asked Jeff Armstrong if there is a method that the Army prefers. She also mentioned that BRAC has their own perchlorate inventory database that they keep up on an annual basis

Jim Sher also cautioned that the hit of perchlorate identified at Well 134 is near a water supply well. Rose Zeiler indicated that Shaw is conducting a capture zone analysis for the public



supply wells which would indicate whether or not onsite contaminants may be drawn into the water supply wells.

#### **UXO Training After TRC Meeting**

UXO training will be conducted on June 3, the day after the TRC meeting at Longhorn AAP. Cliff Murray said that there may be over 20 people attending the training. Jim Sher, TCEQ, said he would be at the TRC meeting only. *(The training is now scheduled for the afternoon of June 2.)*

#### **Miscellaneous Items**

Cliff Murray mentioned that he, Paul Bruckwicki, USFWS, and Craig Giggelman, USFWS, would arrive on June 1 to scout out future sampling locations, a trip that was postponed from this past week. *(The scouting trip has been postponed due to conflict in schedule.)*

Cliff Murray also mentioned that lactate was fed to the plume at Site 16 via injection wells by Geosyntec. Samples are collected every two weeks to monitor progress. GeoSyntec will provide a report.

Jeff Armstrong said that the scoping visit for PBC has been pushed back to August due to scheduling issues with AEC's PBC team. The earliest a procurement could go out for bid would probably be in the first or second quarter of next year. He is interested in input from the regulators. AEC wants to make sure that they are not making decisions in a vacuum and that want to ensure there is a consensus on the approach.

Cliff Murray suggested that, after talking to some local residents in Karnack, an evening TRC meeting may attract more participation from the local population. He also mentioned that he has thought about holding a pre-TRC meeting at Longhorn the evening before the regular TRC meeting. Wilma Subra thought that a previous evening meeting at the Fire Station was well received. Jim Sher said he could be available for such a meeting. September is a tentative target to implement this meeting.

#### **Action Items**

- TCEQ to provide comments on the Site 12 FS *(comments have since been received)*
- EPA to provide comments on the Background Soil Sampling Report
- Shaw to provide communication to the team on the classification of the waste soil that might be generated at Site 32 during remediation



**Shaw**® Shaw Environmental, Inc.

**Status of Technical Documents  
Longhorn Army Ammunition Plant  
Monthly Managers Meeting  
May 19, 2004**

| No. | Documents in Progress                                                                | Submittal Date | Comments Due/Received from USACE/Regulators | Comment Resolution | Status                | Remarks                                                                                                                               |
|-----|--------------------------------------------------------------------------------------|----------------|---------------------------------------------|--------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Revised Draft-Final Rev 01 Feasibility Study, Site-12 to regulators                  | 2/27/04        | EPA comments rec'd: 5/14/04                 |                    | Submitted. In review. | Comments received from EPA on 5/14/04. Other comments are pending.                                                                    |
| 2   | Draft Final Soils Report - Background Study                                          | 3/01/04        | TCEQ comments rec'd: 5/14/04                |                    | Submitted. In review. | Comments received from TCEQ on 5/14/04. Other comments are pending.                                                                   |
| 3   | LHAAP-32 Revised Draft Final Feasibility Study Report                                | On hold        | -                                           | -                  | On hold.              | Regulators requested further sampling at the site. Document submittal to regulators is on hold until sampling is performed.           |
| 4   | Final ECOP document                                                                  | 4/29/04        | NA                                          | NA                 | Submitted.            | No comments are expected.                                                                                                             |
| 5   | Draft Feasibility Study, LHAAP-67                                                    | 6/02/04        | 6/16/04                                     | 6/30/04            | In preparation.       | To be submitted to USACE for review.                                                                                                  |
| 6   | Revised Draft Final Work Plan, Installation-wide Baseline Ecological Risk Assessment | 9/01/04        | 10/13/04                                    | 11/03/04           | In preparation        | Step 3 is currently in progress. The work plan revision is also in progress. Results of Step 3 will be incorporated in the work plan. |

032297

**Perimeter Well/Harrison Bayou/Goose Prairie Creek  
Sampling Conditions  
March 2004**

**Perimeter Wells**

Due to high groundwater conditions, all six perimeter wells (108, 110, 111, 112, 133, 134) were sampled with low flow techniques on 30 – 31 March 2004.

**Harrison Bayou**

Harrison Bayou was sampled Tuesday 30 March 2004. Sampling was started at approximately 0745 with the last sample collected at 0940 from the stream itself. Samples on Caddo Lake at the outfall of Harrison Bayou were sampled from a boat between 1310 and 1340 on the same day. Weather conditions included clear skies with temperatures ranging from the mid-40's in the morning to around 70 degrees in the early afternoon with a light wind becoming evident in mid-morning on into the afternoon. Flow in Harrison Bayou was gauged at 708 gpm immediately above the groundwater treatment plant discharge point.

Stream flow was low but stream flow was evident at areas where constriction or obstructions in the stream were present. Stream samples were labeled with the prefix HBW and sampled in the order - 1, 5, 10, 6, 6.5, 7, 8, 9. Lake samples were labeled with the prefix CL-HB and sampled in the order 2, 1, 3.

**Goose Prairie Creek**

Goose Prairie Creek was sampled Wednesday 31 March 2004 between 0810 and 1045. Weather conditions included clear skies and temperatures that ranged from mid-70's to the lower 70's. Samples were labeled with the prefix GPW- and were collected in the order - 5, 9, 6, 4, 3, 2, 1, 7, 12.

Stream flow was very low with no apparent current at locations 2, 4, 5, 6, 7, 9 and 12. All of these 7 locations were stagnant water. Locations 1 and 3 were very shallow constricted portions of the stream where a very low flow was evident. Figure 1 is a photograph of the location of GPW-1 looking west (upstream). Location 3 has normally had 2-3 feet of standing water impounded behind a beaver dam but the beaver dam apparently has been breached as seen by the low water at the location (Figure 2 – looking downstream). The beaver dam at location 2 has been breached as well (Figure 3).

**QUARTERLY SAMPLING RESULTS**

For this reporting period the results are being reported relative to the laboratory's method detection limit (MDL). That is, values greater than the MDL but less than the reporting limit (RL) will be reported with a quantified value qualified with the 'J' designation indicating the value to be estimated. Due to potential errors related to false positive results at low concentrations, some confusion has surfaced regarding low level detections, especially in the perimeter wells. Subsequent reports of results will only show quantified values above the reporting limit. The sample results below are considered as preliminary since they have not been validated.

**Perimeter Wells**

Samples from all wells were analyzed for metals, explosives, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and anions (including perchlorate). There were no detections of explosives, VOCs, or SVOCs in the perimeter well samples. Perchlorate was reported in well 134 at an estimated concentration of 1.84 ug/l (RL=4 ug/l; MDL=0.989 ug/l).

**Harrison Bayou**

All samples were analyzed for VOCs and perchlorate (method 314.0) except HBW-10 which was analyzed for perchlorate only. No perchlorate was detected from the samples from Harrison Bayou. Acetone was reported in samples from all seven locations at estimated values. No other VOCs were detected. It is assumed these values were due to laboratory contamination. Samples collected in Caddo Lake at the outfall of Harrison Bayou and sampled for perchlorate had no detections.

**Goose Prairie Creek**

All samples from Goose Prairie Creek were analyzed for explosives, VOCs and perchlorate. One sample (GPW-1) had a perchlorate detection at a concentration of 13.1 ug/l with no other perchlorate detections from the waters of this stream. No explosives were detected from the nine locations sampled. For VOCs, acetone was detected in eight of the nine locations at concentrations ranging from an estimated 3.17 ug/l to 7.94 ug/l. Again the presence of acetone in all samples indicates contamination from this common laboratory compound. 1,2-dichlorobenzene was detected in one sample (GPW-9) at a concentration of 5.08 ug/l. Styrene was detected at GPW-5 at a concentration of 1.42 ug/l and toluene was detected at GPW-6 at an estimated concentration of 0.836 ug/l.



Figure 1. Location GPW-1 looking to the west (upstream).

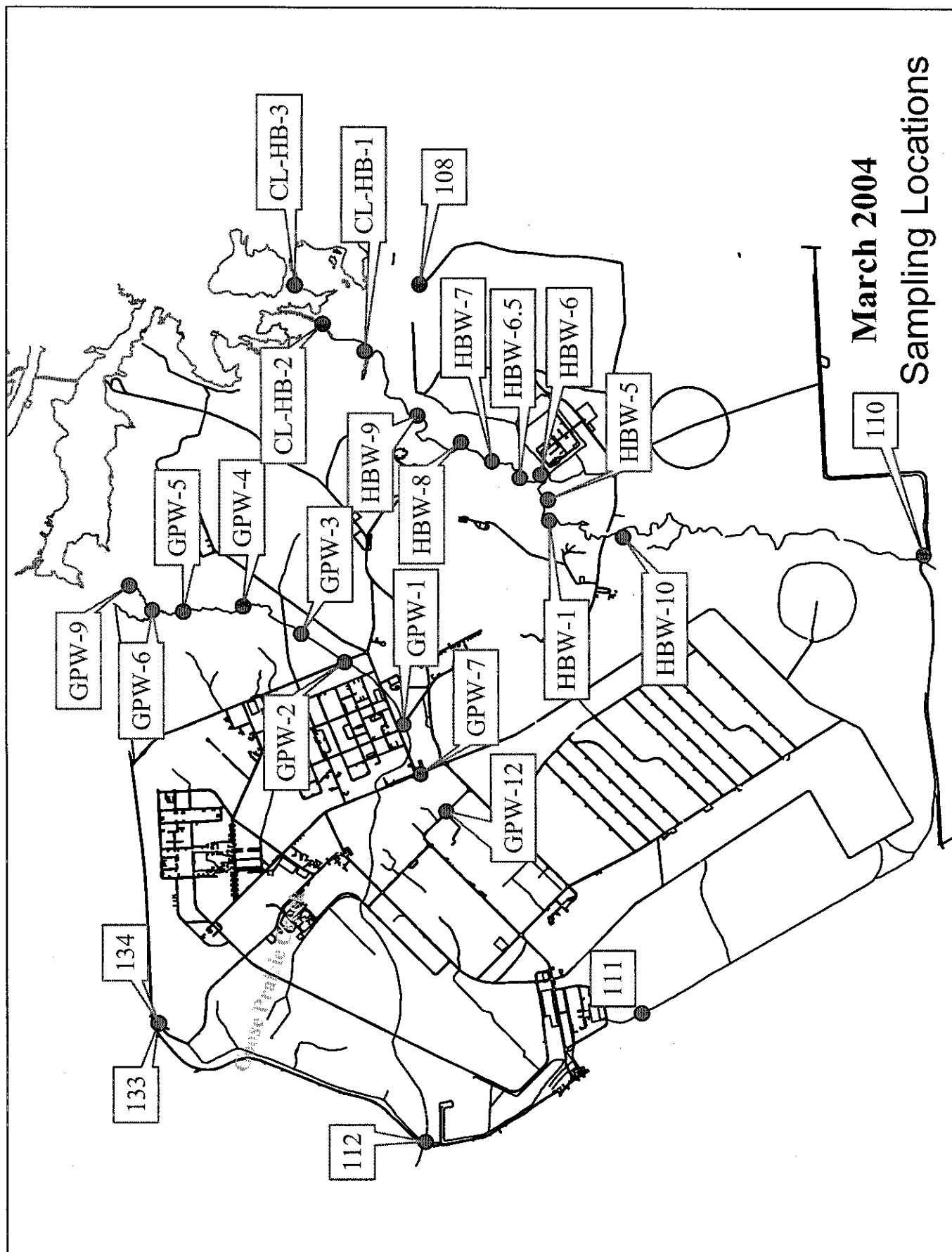


Figure 2. Location GPW-3 looking downstream.



**Figure 3. GPW-2 on west side of Karnack Ave bridge.**





March 2004  
Sampling Locations

## Perimeter WellsMar04\_summary\_DL

Parameter Units PW-MW-108 PW-MW-110 PW-MW-111 PW-MW-112 PW-MW-133 PW-MW-134

**Anions**

|                           |      |         |         |         |         |         |        |
|---------------------------|------|---------|---------|---------|---------|---------|--------|
| Chloride                  | mg/l | 116     | 1930    | 10.2    | 1640    | 8.76    | 2.81   |
| Nitrogen, Nitrate/Nitrite | mg/l | 0.01 J  | < 0.01  | < 0.01  | < 0.01  | 2.78    | 2.24   |
| Perchlorate               | ug/l | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | 1.84 J |
| Sulfate                   | mg/l | 57.4    | 2400    | 26.6    | 1040    | 13.6    | 2.88   |

**Explosives**

|                            |      |         |         |         |         |         |         |
|----------------------------|------|---------|---------|---------|---------|---------|---------|
| 1,3,5-Trinitrobenzene      | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| 2,4,6-Trinitrotoluene      | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| 2,4-Dinitrotoluene         | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| 2,6-Dinitrotoluene         | ug/l | < 0.19  | < 0.182 | < 0.182 | < 0.182 | < 0.182 | < 0.182 |
| 2-Amino-4,6-dinitrotoluene | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| 4-Amino-2,6-dinitrotoluene | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| HMX                        | ug/l | < 0.205 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| m-Dinitrobenzene           | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| m-Nitrotoluene             | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| Nitrobenzene               | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| o-Nitrotoluene             | ug/l | < 0.183 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| p-Nitrotoluene             | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 |
| RDX                        | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 |
| Tetryl                     | ug/l | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.487 |

**Metals**

|           |      |          |          |          |          |         |          |
|-----------|------|----------|----------|----------|----------|---------|----------|
| Aluminum  | ug/l | 26.9 J   | 98.8 J   | 652      | 159      | 48.7 J  | 53.1 J   |
| Antimony  | ug/l | 7.83 J   | 8.03 J   | < 5.08   | 6.84 J   | < 5.08  | < 5.08   |
| Arsenic   | ug/l | < 2.24   | < 22.4   | < 2.24   | < 11.2   | < 2.24  | < 2.24   |
| Barium    | ug/l | 66.4     | 16.3     | 95       | 26.4     | 34.4    | 31.2     |
| Beryllium | ug/l | 1.13 J   | < 0.158  | 0.426 J  | < 0.158  | < 0.158 | < 0.158  |
| Cadmium   | ug/l | 0.393 J  | 0.449 J  | 0.479 J  | 0.502 J  | 0.339 J | 0.355 J  |
| Calcium   | ug/l | 13100    | 302000   | 3890     | 224000   | 8100    | 5320     |
| Chromium  | ug/l | 15.5     | 0.632 J  | 1.38 J   | 0.804 J  | 1.71 J  | 3.3 J    |
| Cobalt    | ug/l | 63.7     | 3.78 J   | 2.86 J   | 12.3     | < 0.541 | < 0.541  |
| Copper    | ug/l | 4.96 J   | < 1.39   | < 1.39   | 1.3 J    | 64.8    | < 1.39   |
| Iron      | ug/l | 89.7 J   | 37.2 J   | 523      | 240      | 16.7 J  | 249      |
| Lead      | ug/l | 7.35     | < 1.72   | < 1.72   | < 1.72   | < 1.72  | < 1.72   |
| Magnesium | ug/l | 9700     | 210000   | 3340     | 295000   | 2730    | 1920     |
| Manganese | ug/l | 1340     | 4750     | 67.7     | 2190     | 9.64 J  | 13.8     |
| Mercury   | ug/l | < 0.0472 | < 0.0472 | < 0.0472 | < 0.0472 | 0.203   | < 0.0472 |
| Nickel    | ug/l | 19.3     | 93       | 4.84 J   | 21.5     | 2.19 J  | 1.69 J   |
| Potassium | ug/l | 397      | 2190     | 283      | 1860     | 2250    | 2060     |
| Selenium  | ug/l | 5.91     | 22.9     | < 2.81   | 23.2     | < 2.81  | < 2.81   |
| Silver    | ug/l | < 0.835  | 1.92 J   | < 0.835  | 1.06 J   | < 0.835 | < 0.835  |
| Strontium | ug/l | 341      | 7330     | 115      | 5960     | 129     | 106      |
| Thallium  | ug/l | < 10     | < 100    | < 10     | < 10     | < 10    | < 10     |
| Vanadium  | ug/l | 29.1     | < 0.606  | 1.1 J    | < 0.606  | < 0.606 | < 0.606  |
| Zinc      | ug/l | 31.5     | 38.7     | 6.63     | 5.97     | 63.3    | 6.91     |

**Volatile Organic Compounds**

|                           |      |        |        |        |        |        |        |
|---------------------------|------|--------|--------|--------|--------|--------|--------|
| 1,1,1,2-Tetrachloroethane | ug/l | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  |
| 1,1,1-Trichloroethane     | ug/l | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 |

## Perimeter WellsMar04\_summary\_DL

| Parameter                   | Units | PW-MW-108 | PW-MW-110 | PW-MW-111 | PW-MW-112 | PW-MW-133 | PW-MW-134 |
|-----------------------------|-------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1,1,2,2-Tetrachloroethane   | ug/l  | < 0.49    | < 0.49    | < 0.49    | < 0.49    | < 0.49    | < 0.49    |
| 1,1,2-Trichloroethane       | ug/l  | < 0.44    | < 0.44    | < 0.44    | < 0.44    | < 0.44    | < 0.44    |
| 1,1-Dichloroethane          | ug/l  | < 0.41    | < 0.41    | < 0.41    | < 0.41    | < 0.41    | < 0.41    |
| 1,1-Dichloroethylene        | ug/l  | < 0.41    | < 0.41    | < 0.41    | < 0.41    | < 0.41    | < 0.41    |
| 1,2,3-Trichloropropane      | ug/l  | < 0.6     | < 0.6     | < 0.6     | < 0.6     | < 0.6     | < 0.6     |
| 1,2,4-Trichlorobenzene      | ug/l  | < 0.42    | < 0.42    | < 0.42    | < 0.42    | < 0.42    | < 0.42    |
| 1,2-Dibromo-3-chloropropane | ug/l  | < 0.75    | < 0.75    | < 0.75    | < 0.75    | < 0.75    | < 0.75    |
| 1,2-Dibromoethane           | ug/l  | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    |
| 1,2-Dichlorobenzene         | ug/l  | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    |
| 1,2-Dichloroethane          | ug/l  | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    |
| 1,2-Dichloropropane         | ug/l  | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    |
| 1,3-Dichlorobenzene         | ug/l  | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    |
| 1,4-Dichlorobenzene         | ug/l  | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    |
| 2-Butanone                  | ug/l  | < 2.31    | < 2.31    | < 2.31    | < 2.31    | < 2.31    | < 2.31    |
| 2-Chloroethylvinyl ether    | ug/l  | < 1.25    | < 1.25    | < 1.25    | < 1.25    | < 1.25    | < 1.25    |
| 2-Hexanone                  | ug/l  | < 1.45    | < 1.45    | < 1.45    | < 1.45    | < 1.45    | < 1.45    |
| 4-Methyl-2-pentanone        | ug/l  | < 1.78    | < 1.78    | < 1.78    | < 1.78    | < 1.78    | < 1.78    |
| Acetone                     | ug/l  | < 2.29    | < 2.29    | < 2.29    | < 2.29    | < 2.29    | < 2.29    |
| Acetonitrile                | ug/l  | < 10.4    | < 10.4    | < 10.4    | < 10.4    | < 10.4    | < 10.4    |
| Acrolein                    | ug/l  | < 4.06    | < 4.06    | < 4.06    | < 4.06    | < 4.06    | < 4.06    |
| Acrylonitrile               | ug/l  | < 2       | < 2       | < 2       | < 2       | < 2       | < 2       |
| Benzene                     | ug/l  | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    |
| Bromochloromethane          | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Bromodichloromethane        | ug/l  | < 0.38    | < 0.38    | < 0.38    | < 0.38    | < 0.38    | < 0.38    |
| Bromoform                   | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | 1.73      | < 0.5     |
| Bromomethane                | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Carbon disulfide            | ug/l  | < 1.91    | < 1.91    | < 1.91    | < 1.91    | < 1.91    | < 1.91    |
| Carbon tetrachloride        | ug/l  | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    |
| Chlorobenzene               | ug/l  | < 0.32    | < 0.32    | < 0.32    | < 0.32    | < 0.32    | < 0.32    |
| Chloroethane                | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Chloroform                  | ug/l  | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    |
| Chloromethane               | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| cis-1,2-Dichloroethylene    | ug/l  | < 0.3     | < 0.3     | < 0.3     | < 0.3     | < 0.3     | < 0.3     |
| cis-1,3-Dichloropropylene   | ug/l  | < 0.3     | < 0.3     | < 0.3     | < 0.3     | < 0.3     | < 0.3     |
| Dibromochloromethane        | ug/l  | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    |
| Dibromomethane              | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Dichlorodifluoromethane     | ug/l  | < 0.43    | < 0.43    | < 0.43    | < 0.43    | < 0.43    | < 0.43    |
| Ethyl methacrylate          | ug/l  | < 1       | < 1       | < 1       | < 1       | < 1       | < 1       |
| Ethylbenzene                | ug/l  | < 0.21    | < 0.21    | < 0.21    | < 0.21    | < 0.21    | < 0.21    |
| Hexachlorobutadiene         | ug/l  | < 0.31    | < 0.31    | < 0.31    | < 0.31    | < 0.31    | < 0.31    |
| Iodomethane                 | ug/l  | < 1.88    | < 1.88    | < 1.88    | < 1.88    | < 1.88    | < 1.88    |
| Methacrylonitrile           | ug/l  | < 1.01    | < 1.01    | < 1.01    | < 1.01    | < 1.01    | < 1.01    |
| Methyl methacrylate         | ug/l  | < 1.11    | < 1.11    | < 1.11    | < 1.11    | < 1.11    | < 1.11    |
| Methylene chloride          | ug/l  | < 1.9     | < 1.9     | < 1.9     | < 1.9     | < 1.9     | < 1.9     |
| Naphthalene                 | ug/l  | < 0.26    | < 0.26    | < 0.26    | < 0.26    | < 0.26    | < 0.26    |
| Propionitrile               | ug/l  | < 1.22    | < 1.22    | < 1.22    | < 1.22    | < 1.22    | < 1.22    |
| Styrene                     | ug/l  | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    |
| Tetrachloroethylene         | ug/l  | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    | < 0.33    |
| Toluene                     | ug/l  | < 0.39    | < 0.39    | < 0.39    | < 0.39    | < 0.39    | < 0.39    |
| trans-1,2-Dichloroethylene  | ug/l  | < 0.37    | < 0.37    | < 0.37    | < 0.37    | < 0.37    | < 0.37    |

## Perimeter WellsMar04\_summary\_DL

| Parameter                   | Units | PW-MW-108 | PW-MW-110 | PW-MW-111 | PW-MW-112 | PW-MW-133 | PW-MW-134 |
|-----------------------------|-------|-----------|-----------|-----------|-----------|-----------|-----------|
| trans-1,3-Dichloropropylene | ug/l  | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    | < 0.29    |
| trans-1,4-Dichloro-2-butene | ug/l  | < 1.17    | < 1.17    | < 1.17    | < 1.17    | < 1.17    | < 1.17    |
| Trichloroethylene           | ug/l  | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    | < 0.36    |
| Trichlorofluoromethane      | ug/l  | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Vinyl acetate               | ug/l  | < 1.32    | < 1.32    | < 1.32    | < 1.32    | < 1.32    | < 1.32    |
| Vinyl chloride              | ug/l  | < 0.55    | < 0.55    | < 0.55    | < 0.55    | < 0.55    | < 0.55    |
| Xylenes (total)             | ug/l  | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    | < 0.25    |

## Semi-Volatile Organic Compounds

|                            |      |         |         |         |         |         |         |
|----------------------------|------|---------|---------|---------|---------|---------|---------|
| 1,2,4,5-Tetrachlorobenzene | ug/l | < 1.16  | < 1.15  | < 1.14  | < 1.14  | < 1.14  | < 1.14  |
| 2,3,4,6-Tetrachlorophenol  | ug/l | < 1.34  | < 1.32  | < 1.31  | < 1.31  | < 1.31  | < 1.31  |
| 2,4,5-Trichlorophenol      | ug/l | < 0.933 | < 0.924 | < 0.915 | < 0.915 | < 0.915 | < 0.915 |
| 2,4,6-Trichlorophenol      | ug/l | < 0.375 | < 0.371 | < 0.368 | < 0.368 | < 0.368 | < 0.368 |
| 2,4-Dichlorophenol         | ug/l | < 0.452 | < 0.448 | < 0.443 | < 0.443 | < 0.443 | < 0.443 |
| 2,4-Dimethylphenol         | ug/l | < 0.452 | < 0.448 | < 0.443 | < 0.443 | < 0.443 | < 0.443 |
| 2,4-Dinitrophenol          | ug/l | < 4.81  | < 4.76  | < 4.72  | < 4.72  | < 4.72  | < 4.72  |
| 2,4-Dinitrotoluene         | ug/l | < 0.673 | < 0.667 | < 0.66  | < 0.66  | < 0.66  | < 0.66  |
| 2,6-Dichlorophenol         | ug/l | < 0.846 | < 0.838 | < 0.83  | < 0.83  | < 0.83  | < 0.83  |
| 2,6-Dinitrotoluene         | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| 2-Chloronaphthalene        | ug/l | < 0.385 | < 0.381 | < 0.377 | < 0.377 | < 0.377 | < 0.377 |
| 2-Chlorophenol             | ug/l | < 0.394 | < 0.39  | < 0.387 | < 0.387 | < 0.387 | < 0.387 |
| 2-Methyl-4,6-dinitrophenol | ug/l | < 0.962 | < 0.952 | < 0.943 | < 0.943 | < 0.943 | < 0.943 |
| 2-Methylnaphthalene        | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| 2-Nitrophenol              | ug/l | < 0.567 | < 0.562 | < 0.557 | < 0.557 | < 0.557 | < 0.557 |
| 3,3'-Dichlorobenzidine     | ug/l | < 0.49  | < 0.486 | < 0.481 | < 0.481 | < 0.481 | < 0.481 |
| 3,3'-Dimethylbenzidine     | ug/l | < 1.64  | < 1.63  | < 1.61  | < 1.61  | < 1.61  | < 1.61  |
| 4-Bromophenylphenylether   | ug/l | < 1.17  | < 1.16  | < 1.15  | < 1.15  | < 1.15  | < 1.15  |
| 4-Chloro-3-methylphenol    | ug/l | < 0.663 | < 0.657 | < 0.651 | < 0.651 | < 0.651 | < 0.651 |
| 4-Chloroaniline            | ug/l | < 1.06  | < 1.05  | < 1.04  | < 1.04  | < 1.04  | < 1.04  |
| 4-Chlorophenylphenylether  | ug/l | < 0.808 | < 0.8   | < 0.792 | < 0.792 | < 0.792 | < 0.792 |
| 4-Nitrophenol              | ug/l | < 4.81  | < 4.76  | < 4.72  | < 4.72  | < 4.72  | < 4.72  |
| Acenaphthylene             | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Acetophenone               | ug/l | < 0.356 | < 0.352 | < 0.349 | < 0.349 | < 0.349 | < 0.349 |
| Aniline                    | ug/l | < 1.55  | < 1.53  | < 1.52  | < 1.52  | < 1.52  | < 1.52  |
| Anthracene                 | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzo(a)anthracene         | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzo(a)pyrene             | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzo(b)fluoranthene       | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzo(ghi)perylene         | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzo(k)fluoranthene       | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Benzyl alcohol             | ug/l | < 0.875 | < 0.867 | < 0.858 | < 0.858 | < 0.858 | < 0.858 |
| bis(2-Chloroethoxy)methane | ug/l | < 0.462 | < 0.457 | < 0.453 | < 0.453 | < 0.453 | < 0.453 |
| bis(2-Chloroethyl) ether   | ug/l | < 1.32  | < 1.3   | < 1.29  | < 1.29  | < 1.29  | < 1.29  |
| bis(2-Ethylhexyl)phthalate | ug/l | < 1.25  | < 1.24  | < 1.23  | < 1.23  | < 1.23  | < 1.23  |
| Butylbenzylphthalate       | ug/l | < 0.654 | < 0.648 | < 0.642 | < 0.642 | < 0.642 | < 0.642 |
| Chlorobenzilate            | ug/l | < 0.606 | < 0.6   | < 0.594 | < 0.594 | < 0.594 | < 0.594 |
| Chrysene                   | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Dibenzo(a,h)anthracene     | ug/l | < 0.481 | < 0.476 | < 0.472 | < 0.472 | < 0.472 | < 0.472 |
| Dibenzofuran               | ug/l | < 0.404 | < 0.4   | < 0.396 | < 0.396 | < 0.396 | < 0.396 |
| Diethylphthalate           | ug/l | < 0.856 | < 0.848 | < 0.84  | < 0.84  | < 0.84  | < 0.84  |

## Perimeter WellsMar04\_summary\_DL

| Parameter                     | Units | PW-MW-108 | PW-MW-110 | PW-MW-111 | PW-MW-112 | PW-MW-133 | PW-MW-134 |
|-------------------------------|-------|-----------|-----------|-----------|-----------|-----------|-----------|
| Dimethylphthalate             | ug/l  | < 0.51    | < 0.505   | < 0.5     | < 0.5     | < 0.5     | < 0.5     |
| Di-n-butylphthalate           | ug/l  | < 0.962   | < 0.952   | < 0.943   | < 0.943   | < 0.943   | < 0.943   |
| Di-n-octylphthalate           | ug/l  | < 0.837   | < 0.829   | < 0.821   | < 0.821   | < 0.821   | < 0.821   |
| Diphenylamine                 | ug/l  | < 0.76    | < 0.752   | < 0.745   | < 0.745   | < 0.745   | < 0.745   |
| Ethyl Methanesulfonate        | ug/l  | < 0.942   | < 0.923   | < 0.925   | < 0.925   | < 0.925   | < 0.925   |
| Fluoranthene                  | ug/l  | < 0.481   | < 0.476   | < 0.472   | < 0.472   | < 0.472   | < 0.472   |
| Fluorene                      | ug/l  | < 0.481   | < 0.476   | < 0.472   | < 0.472   | < 0.472   | < 0.472   |
| Hexachlorobenzene             | ug/l  | < 0.625   | < 0.619   | < 0.613   | < 0.613   | < 0.613   | < 0.613   |
| Hexachlorocyclopentadiene     | ug/l  | < 0.962   | < 0.952   | < 0.943   | < 0.943   | < 0.943   | < 0.943   |
| Hexachloroethane              | ug/l  | < 0.413   | < 0.41    | < 0.406   | < 0.406   | < 0.406   | < 0.406   |
| Indeno(1,2,3-cd)pyrene        | ug/l  | < 0.481   | < 0.476   | < 0.472   | < 0.472   | < 0.472   | < 0.472   |
| m,p-Cresols                   | ug/l  | < 0.567   | < 0.562   | < 0.557   | < 0.557   | < 0.557   | < 0.557   |
| Methyl methanesulfonate       | ug/l  | < 0.779   | < 0.771   | < 0.764   | < 0.764   | < 0.764   | < 0.764   |
| m-Nitroaniline                | ug/l  | < 0.962   | < 0.952   | < 0.943   | < 0.943   | < 0.943   | < 0.943   |
| Nitrobenzene                  | ug/l  | < 0.606   | < 0.6     | < 0.594   | < 0.594   | < 0.594   | < 0.594   |
| N-Methyl-N-nitrosomethylamine | ug/l  | < 4.81    | < 4.76    | < 4.72    | < 4.72    | < 4.72    | < 4.72    |
| N-Nitrosodiethylamine         | ug/l  | < 4.81    | < 4.76    | < 4.72    | < 4.72    | < 4.72    | < 4.72    |
| N-Nitrosodi-n-butylamine      | ug/l  | < 1.03    | < 1.02    | < 1.01    | < 1.01    | < 1.01    | < 1.01    |
| N-Nitrosodipropylamine        | ug/l  | < 0.721   | < 0.714   | < 0.708   | < 0.708   | < 0.708   | < 0.708   |
| o-Cresol                      | ug/l  | < 0.433   | < 0.429   | < 0.425   | < 0.425   | < 0.425   | < 0.425   |
| o-Nitroaniline                | ug/l  | < 0.615   | < 0.61    | < 0.604   | < 0.604   | < 0.604   | < 0.604   |
| Pentachlorobenzene            | ug/l  | < 1.15    | < 1.14    | < 1.13    | < 1.13    | < 1.13    | < 1.13    |
| Pentachloronitrobenzene       | ug/l  | < 1.9     | < 1.89    | < 1.87    | < 1.87    | < 1.87    | < 1.87    |
| Pentachlorophenol             | ug/l  | < 4.81    | < 4.76    | < 4.72    | < 4.72    | < 4.72    | < 4.72    |
| Phenacetin                    | ug/l  | < 1.7     | < 1.69    | < 1.67    | < 1.67    | < 1.67    | < 1.67    |
| Phenanthrene                  | ug/l  | < 0.481   | < 0.476   | < 0.472   | < 0.472   | < 0.472   | < 0.472   |
| Phenol                        | ug/l  | < 0.288   | < 0.286   | < 0.283   | < 0.283   | < 0.283   | < 0.283   |
| p-Nitroaniline                | ug/l  | < 0.644   | < 0.638   | < 0.632   | < 0.632   | < 0.632   | < 0.632   |
| Pyrene                        | ug/l  | < 0.481   | < 0.476   | < 0.472   | < 0.472   | < 0.472   | < 0.472   |
| Pyridine                      | ug/l  | < 4.81    | < 4.76    | < 4.72    | < 4.72    | < 4.72    | < 4.72    |

HBW Mar04\_summary\_DL

| Parameter   | Units | HBW-1   | HBW-5   | HBW-6   | HBW-6_5 | HBW-7   | HBW-8   | HBW-9   | HBW-10  |
|-------------|-------|---------|---------|---------|---------|---------|---------|---------|---------|
| Perchlorate | ug/l  | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 |

**Volatile Organic Compounds**

|                             |      |        |        |        |        |        |        |        |
|-----------------------------|------|--------|--------|--------|--------|--------|--------|--------|
| 1,1,1,2-Tetrachloroethane   | ug/l | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  |
| 1,1,1-Trichloroethane       | ug/l | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 |
| 1,1,2,2-Tetrachloroethane   | ug/l | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 |
| 1,1,2-Trichloroethane       | ug/l | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 |
| 1,1-Dichloroethane          | ug/l | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 |
| 1,1-Dichloroethylene        | ug/l | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 |
| 1,2,3-Trichloropropane      | ug/l | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  |
| 1,2,4-Trichlorobenzene      | ug/l | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 |
| 1,2-Dibromo-3-chloropropane | ug/l | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 |
| 1,2-Dibromoethane           | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 |
| 1,2-Dichlorobenzene         | ug/l | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 |
| 1,2-Dichloroethane          | ug/l | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 |
| 1,2-Dichloropropane         | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 |
| 1,3-Dichlorobenzene         | ug/l | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 |
| 1,4-Dichlorobenzene         | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 |
| 2-Butanone                  | ug/l | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 |
| 2-Chloroethylvinyl ether    | ug/l | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 |
| 2-Hexanone                  | ug/l | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 |
| 4-Methyl-2-pentanone        | ug/l | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 |
| Acetone                     | ug/l | 3 J    | 2.54 J | 3.39 J | 2.33 J | 2.45 J | 3.48 J | 3.88 J |
| Acetonitrile                | ug/l | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 |
| Acrolein                    | ug/l | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 |
| Acrylonitrile               | ug/l | < 2    | < 2    | < 2    | < 2    | < 2    | < 2    | < 2    |
| Benzene                     | ug/l | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 |
| Bromochloromethane          | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| Bromodichloromethane        | ug/l | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 |
| Bromoform                   | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| Bromomethane                | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| Carbon disulfide            | ug/l | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 |
| Carbon tetrachloride        | ug/l | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 |
| Chlorobenzene               | ug/l | < 0.32 | < 0.32 | < 0.32 | < 0.32 | < 0.32 | < 0.32 | < 0.32 |
| Chloroethane                | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| Chloroform                  | ug/l | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 |
| Chloromethane               | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| cis-1,2-Dichloroethylene    | ug/l | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  |
| cis-1,3-Dichloropropylene   | ug/l | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  |
| Dibromochloromethane        | ug/l | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 |
| Dibromomethane              | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  |
| Dichlorodifluoromethane     | ug/l | < 0.43 | < 0.43 | < 0.43 | < 0.43 | < 0.43 | < 0.43 | < 0.43 |
| Ethyl methacrylate          | ug/l | < 1    | < 1    | < 1    | < 1    | < 1    | < 1    | < 1    |
| Ethylbenzene                | ug/l | < 0.21 | < 0.21 | < 0.21 | < 0.21 | < 0.21 | < 0.21 | < 0.21 |
| Hexachlorobutadiene         | ug/l | < 0.31 | < 0.31 | < 0.31 | < 0.31 | < 0.31 | < 0.31 | < 0.31 |
| Iodomethane                 | ug/l | < 1.88 | < 1.88 | < 1.88 | < 1.88 | < 1.88 | < 1.88 | < 1.88 |
| Methacrylonitrile           | ug/l | < 1.01 | < 1.01 | < 1.01 | < 1.01 | < 1.01 | < 1.01 | < 1.01 |
| Methyl methacrylate         | ug/l | < 1.11 | < 1.11 | < 1.11 | < 1.11 | < 1.11 | < 1.11 | < 1.11 |
| Methylene chloride          | ug/l | < 1.9  | < 1.9  | < 1.9  | < 1.9  | < 1.9  | < 1.9  | < 1.9  |



| Parameter                   | Units | HBW-1  | HBW-5  | HBW-6  | HBW-6 5 | HBW-7  | HBW-8  | HBW-9  | HBW-10 |
|-----------------------------|-------|--------|--------|--------|---------|--------|--------|--------|--------|
| Naphthalene                 | ug/l  | < 0.26 | < 0.26 | < 0.26 | < 0.26  | < 0.26 | < 0.26 | < 0.26 |        |
| Propionitrile               | ug/l  | < 1.22 | < 1.22 | < 1.22 | < 1.22  | < 1.22 | < 1.22 | < 1.22 |        |
| Styrene                     | ug/l  | < 0.25 | < 0.25 | < 0.25 | < 0.25  | < 0.25 | < 0.25 | < 0.25 |        |
| Tetrachloroethylene         | ug/l  | < 0.33 | < 0.33 | < 0.33 | < 0.33  | < 0.33 | < 0.33 | < 0.33 |        |
| Toluene                     | ug/l  | < 0.39 | < 0.39 | < 0.39 | < 0.39  | < 0.39 | < 0.39 | < 0.39 |        |
| trans-1,2-Dichloroethylene  | ug/l  | < 0.37 | < 0.37 | < 0.37 | < 0.37  | < 0.37 | < 0.37 | < 0.37 |        |
| trans-1,3-Dichloropropylene | ug/l  | < 0.29 | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.29 | < 0.29 |        |
| trans-1,4-Dichloro-2-butene | ug/l  | < 1.17 | < 1.17 | < 1.17 | < 1.17  | < 1.17 | < 1.17 | < 1.17 |        |
| Trichloroethylene           | ug/l  | < 0.36 | < 0.36 | < 0.36 | < 0.36  | < 0.36 | < 0.36 | < 0.36 |        |
| Trichlorofluoromethane      | ug/l  | < 0.5  | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5  | < 0.5  |        |
| Vinyl acetate               | ug/l  | < 1.32 | < 1.32 | < 1.32 | < 1.32  | < 1.32 | < 1.32 | < 1.32 |        |
| Vinyl chloride              | ug/l  | < 0.55 | < 0.55 | < 0.55 | < 0.55  | < 0.55 | < 0.55 | < 0.55 |        |
| Xylenes (total)             | ug/l  | < 0.25 | < 0.25 | < 0.25 | < 0.25  | < 0.25 | < 0.25 | < 0.25 |        |

|             |      | CL-HB-1 | CL-HB-2 | CL-HB-3 |
|-------------|------|---------|---------|---------|
| Perchlorate | ug/l | < 0.989 | < 0.989 | < 0.989 |

## GPW Mar04\_summary\_DL

| Parameter   | Units | GPW-1 | GPW-2   | GPW-3   | GPW-4   | GPW-5   | GPW-6   | GPW-7   | GPW-9  | GPW-12  |
|-------------|-------|-------|---------|---------|---------|---------|---------|---------|--------|---------|
| Perchlorate | ug/l  | 13.1  | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.989 | < 0.33 | < 0.989 |

**Explosives**

|                            |      |         |         |         |         |         |         |         |         |         |
|----------------------------|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1,3,5-Trinitrobenzene      | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.3   | < 0.325 |
| 2,4,6-Trinitrotoluene      | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.34  | < 0.162 |
| 2,4-Dinitrotoluene         | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.49  | < 0.325 |
| 2,6-Dinitrotoluene         | ug/l | < 0.182 | < 0.182 | < 0.182 | < 0.182 | < 0.182 | < 0.182 | < 0.182 | < 0.44  | < 0.182 |
| 2-Amino-4,6-dinitrotoluene | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.41  | < 0.325 |
| 4-Amino-2,6-dinitrotoluene | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.41  | < 0.162 |
| HMX                        | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.6   | < 0.162 |
| m-Dinitrobenzene           | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.42  | < 0.325 |
| m-Nitrotoluene             | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.75  | < 0.325 |
| Nitrobenzene               | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.25  | < 0.162 |
| o-Nitrotoluene             | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.36  | < 0.162 |
| p-Nitrotoluene             | ug/l | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.325 | < 0.29  | < 0.325 |
| RDX                        | ug/l | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.162 | < 0.25  | < 0.162 |
| Tetryl                     | ug/l | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.487 | < 0.325 | < 0.487 |

**Volatile Organic Compounds**

|                             |      |        |        |        |        |        |        |        |         |        |
|-----------------------------|------|--------|--------|--------|--------|--------|--------|--------|---------|--------|
| 1,1,1,2-Tetrachloroethane   | ug/l | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.3  | < 0.25  | < 0.3  |
| 1,1,1-Trichloroethane       | ug/l | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.34 | < 0.162 | < 0.34 |
| 1,1,2,2-Tetrachloroethane   | ug/l | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.49 | < 0.325 | < 0.49 |
| 1,1,2-Trichloroethane       | ug/l | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.44 | < 0.182 | < 0.44 |
| 1,1-Dichloroethane          | ug/l | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.325 | < 0.41 |
| 1,1-Dichloroethylene        | ug/l | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 0.41 | < 2.31  | < 0.41 |
| 1,2,3-Trichloropropane      | ug/l | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 0.6  | < 1.25  | < 0.6  |
| 1,2,4-Trichlorobenzene      | ug/l | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 0.42 | < 1.45  | < 0.42 |
| 1,2-Dibromo-3-chloropropane | ug/l | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.75 | < 0.162 | < 0.75 |
| 1,2-Dibromoethane           | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 1.78  | < 0.25 |
| 1,2-Dichlorobenzene         | ug/l | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | < 0.36 | 5.08    | < 0.36 |
| 1,2-Dichloroethane          | ug/l | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 0.29 | < 10.4  | < 0.29 |
| 1,2-Dichloropropane         | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 4.06  | < 0.25 |
| 1,3-Dichlorobenzene         | ug/l | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 2     | < 0.33 |
| 1,4-Dichlorobenzene         | ug/l | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.33  | < 0.25 |
| 2-Butanone                  | ug/l | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 2.31 | < 0.5   | < 2.31 |
| 2-Chloroethylvinyl ether    | ug/l | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 1.25 | < 0.38  | < 1.25 |
| 2-Hexanone                  | ug/l | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 1.45 | < 0.5   | < 1.45 |
| 4-Methyl-2-pentanone        | ug/l | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 1.78 | < 0.5   | < 1.78 |
| Acetone                     | ug/l | 5.79   | 3.17 J | 4.27 J | 4.08 J | 7.29   | 1.94   | 5.28   | < 1.91  | 7.51   |
| Acetonitrile                | ug/l | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 10.4 | < 0.29  | < 10.4 |
| Acrolein                    | ug/l | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 4.06 | < 0.32  | < 4.06 |
| Acrylonitrile               | ug/l | < 2    | < 2    | < 2    | < 2    | < 2    | < 2    | < 2    | < 0.5   | < 2    |
| Benzene                     | ug/l | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.33 | < 0.36  | < 0.33 |
| Bromochloromethane          | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5   | < 0.5  |
| Bromodichloromethane        | ug/l | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.38 | < 0.3   | < 0.38 |
| Bromoform                   | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.3   | < 0.5  |
| Bromomethane                | ug/l | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.5  | < 0.29  | < 0.5  |
| Carbon disulfide            | ug/l | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 1.91 | < 0.5   | < 1.91 |

GPW Mar04\_summary\_DL

| Parameter                   | Units | GPW-1  | GPW-2  | GPW-3   | GPW-4  | GPW-5  | GPW-6   | GPW-7  | GPW-9   | GPW-12 |
|-----------------------------|-------|--------|--------|---------|--------|--------|---------|--------|---------|--------|
| Carbon tetrachloride        | ug/l  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.43  | < 0.29 |
| Chlorobenzene               | ug/l  | < 0.32 | < 0.32 | < 0.32  | < 0.32 | < 0.32 | < 0.32  | < 0.32 | < 1     | < 0.32 |
| Chloroethane                | ug/l  | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.21  | < 0.5  |
| Chloroform                  | ug/l  | < 0.36 | < 0.36 | < 0.36  | < 0.36 | < 0.36 | < 0.36  | < 0.36 | < 0.31  | < 0.36 |
| Chloromethane               | ug/l  | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.162 | < 0.5  |
| cis-1,2-Dichloroethylene    | ug/l  | < 0.3  | < 0.3  | < 0.3   | < 0.3  | < 0.3  | < 0.3   | < 0.3  | < 1.88  | < 0.3  |
| cis-1,3-Dichloropropylene   | ug/l  | < 0.3  | < 0.3  | < 0.3   | < 0.3  | < 0.3  | < 0.3   | < 0.3  | < 0.325 | < 0.3  |
| Dibromochloromethane        | ug/l  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 1.01  | < 0.29 |
| Dibromomethane              | ug/l  | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 1.11  | < 0.5  |
| Dichlorodifluoromethane     | ug/l  | < 0.43 | < 0.43 | < 0.43  | < 0.43 | < 0.43 | < 0.43  | < 0.43 | < 1.9   | < 0.43 |
| Ethyl methacrylate          | ug/l  | < 1    | < 1    | < 1     | < 1    | < 1    | < 1     | < 1    | < 0.325 | < 1    |
| Ethylbenzene                | ug/l  | < 0.21 | < 0.21 | < 0.21  | < 0.21 | < 0.21 | < 0.21  | < 0.21 | < 0.26  | < 0.21 |
| Hexachlorobutadiene         | ug/l  | < 0.31 | < 0.31 | < 0.31  | < 0.31 | < 0.31 | < 0.31  | < 0.31 | < 0.162 | < 0.31 |
| Iodomethane                 | ug/l  | < 1.88 | < 1.88 | < 1.88  | < 1.88 | < 1.88 | < 1.88  | < 1.88 | < 0.162 | < 1.88 |
| Methacrylonitrile           | ug/l  | < 1.01 | < 1.01 | < 1.01  | < 1.01 | < 1.01 | < 1.01  | < 1.01 | < 0.989 | < 1.01 |
| Methyl methacrylate         | ug/l  | < 1.11 | < 1.11 | < 1.11  | < 1.11 | < 1.11 | < 1.11  | < 1.11 | < 0.325 | < 1.11 |
| Methylene chloride          | ug/l  | < 1.9  | < 1.9  | < 1.9   | < 1.9  | < 1.9  | < 1.9   | < 1.9  | < 1.22  | < 1.9  |
| Naphthalene                 | ug/l  | < 0.26 | < 0.26 | < 0.26  | < 0.26 | < 0.26 | < 0.26  | < 0.26 | < 0.162 | < 0.26 |
| Propionitrile               | ug/l  | < 1.22 | < 1.22 | < 1.22  | < 1.22 | < 1.22 | < 1.22  | < 1.22 | < 0.25  | < 1.22 |
| Styrene                     | ug/l  | < 0.25 | < 0.25 | < 0.25  | < 0.25 | 1.42   | < 0.25  | < 0.25 | < 0.33  | < 0.25 |
| Tetrachloroethylene         | ug/l  | < 0.33 | < 0.33 | < 0.33  | < 0.33 | < 0.33 | < 0.33  | < 0.33 | < 0.487 | < 0.33 |
| Toluene                     | ug/l  | < 0.39 | < 0.39 | 0.465 J | < 0.39 | < 0.39 | 0.836 J | < 0.39 | < 0.39  | < 0.39 |
| trans-1,2-Dichloroethylene  | ug/l  | < 0.37 | < 0.37 | < 0.37  | < 0.37 | < 0.37 | < 0.37  | < 0.37 | < 0.37  | < 0.37 |
| trans-1,3-Dichloropropylene | ug/l  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.29 | < 0.29  | < 0.29 | < 0.29  | < 0.29 |
| trans-1,4-Dichloro-2-butene | ug/l  | < 1.17 | < 1.17 | < 1.17  | < 1.17 | < 1.17 | < 1.17  | < 1.17 | < 1.17  | < 1.17 |
| Trichloroethylene           | ug/l  | < 0.36 | < 0.36 | < 0.36  | < 0.36 | < 0.36 | < 0.36  | < 0.36 | < 0.36  | < 0.36 |
| Trichlorofluoromethane      | ug/l  | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5  | < 0.5   | < 0.5  | < 0.5   | < 0.5  |
| Vinyl acetate               | ug/l  | < 1.32 | < 1.32 | < 1.32  | < 1.32 | < 1.32 | < 1.32  | < 1.32 | < 1.32  | < 1.32 |
| Vinyl chloride              | ug/l  | < 0.55 | < 0.55 | < 0.55  | < 0.55 | < 0.55 | < 0.55  | < 0.55 | < 0.55  | < 0.55 |
| Xylenes (total)             | ug/l  | < 0.25 | < 0.25 | < 0.25  | < 0.25 | < 0.25 | < 0.25  | < 0.25 | < 0.25  | < 0.25 |



DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
BOX 3, BUILDING 1440  
FORT CHAFFEE, ARKANSAS 72905

032311

REPLY TO  
ATTENTION OF

DAIM BD H LO

May 20, 2004

Mr. Chris Villarreal  
US Environmental Protection Agency  
Superfund Division (6SF-AT)n  
1445 Ross Avenue  
Dallas, TX 75202-2733

Re: Environmental Condition of Property I  
(ECOP), Longhorn Army Ammunition  
Plant, Karnack, Texas, April 2004

Dear Mr. Villarreal,

It has come to my attention that during reproduction of the Final ECOP, some formatting changes were made to the electronic copy of the signed ECOP I. To prevent any confusion in the future, please discard the document sent to you on April 29, 2004 and replace with the one transmitted with this letter.

Please accept my apologies for any inconvenience this may have caused you. Point of contact for this action is the undersigned. I may be contacted at 479-484-2516 or 2055.

Sincerely,

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

Enclosure

Copies furnished:

James Sher, Texas Commission on Environmental Quality

Paul Cornes, USFWS, Region 2, Albuquerque

Paul Bruckwicki, USFWS, Caddo Lake NWR, TX

Susan Trussell, COE-Tulsa District

Cliff Murray, COE-Tulsa District

Jeff Armstrong, AEC

June Ahrens, COE-Fort Worth District

REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
HAMPTON FIELD OFFICE, ARMY BASE REALIGNMENT AND CLOSURE  
102 MCNAIR DRIVE  
FORT MONROE VIRGINIA 23651

DAIM-BD-H

6 May 2004

## MEMORANDUM FOR RECORD

SUBJECT: Environmental Condition of Property I (ECOP) – Correction Page

1. Attached for your records: Correction to Table 2 of the Environmental Condition of Property (ECOP) I- Longhorn Army Ammunition Plant. Please replace Table 2 of your document with the enclosed corrected page. The footnote of Table 2 was incorrectly labeled "Draft". Please provide this correction to all person or agencies that you provided a previous copy of the ECOP.

2. Point of contact is Ms. Francine Cole, Hampton Field Office, DSN 680-4370, commercial (757) 788-4370.

Attached:  
Corrected Table 2

KAREN L. BARNES  
Environmental Scientist  
Providing Contract Environmental  
Support to BRAC - Hampton Field  
Office

**Table 2**  
**Community Environmental Response Facilitation Act Categories and Codes**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Category                                       | Description                                                                                                                                                                                  |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category 1                                     | Areas where no release or disposal of hazardous substance or petroleum products has occurred (including no migration of these substances from adjacent areas)                                |
| Category 2                                     | Areas where only release or disposal of petroleum products has occurred                                                                                                                      |
| Category 3                                     | Areas where release, disposal, and or migration of hazardous substance has occurred, but at concentrations that do not require a removal or remedial response                                |
| Category 4                                     | Areas where release, disposal, and or migration of hazardous substance has occurred, and all removal or remedial actions to protect human health and the environment have been taken         |
| Category 5                                     | Areas where release, disposal, and or migration of hazardous substance has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken |
| Category 6                                     | Areas where release, disposal, and or migration of hazardous substance has occurred, but required actions have not yet been implemented                                                      |
| Category 7                                     | Areas that are not evaluated or require additional evaluation                                                                                                                                |
| <b>CERCLA Codes for Categories 2 through 7</b> |                                                                                                                                                                                              |
| HS                                             | Indicates hazardous substance storage                                                                                                                                                        |
| HR                                             | Indicates hazardous substance release and/or storage                                                                                                                                         |
| PR                                             | Indicates petroleum substance release and/or storage                                                                                                                                         |
| PS                                             | Indicates petroleum substance storage                                                                                                                                                        |
| (P)                                            | Indicates possible release or disposal, unverified by sampling or analysis                                                                                                                   |

Abbreviations:

CERCLA    *Comprehensive Environmental Response, Compensation, and Liability Act*



***FINAL***  
**ENVIRONMENTAL CONDITION OF PROPERTY I**  
**(ECOP)**



**LONGHORN ARMY AMMUNITION PLANT**  
**KARNACK, TEXAS**

**APRIL 2004**



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
HAMPTON FIELD OFFICE, ARMY BASE REALIGNMENT AND CLOSURE  
102 MCNAIR DRIVE  
FORT MONROE VIRGINIA 23651

DAIM-BD-H

28 April 2004

MEMORANDUM FOR Assistant Chief of Staff for Installation Management, 600 Army  
Pentagon, Washington, D.C. 20310-0600

SUBJECT: Environmental Condition of Property I (ECOP)

1. Enclosed for your records: Environmental Condition of Property (ECOP)  
5,935 acres (Land and Facilities) at the Former Longhorn Army Ammunition Plant  
(LHAAP). The document received Installation, Regulatory (State & EPA), Hampton  
Field Office (HFO) Legal and Environmental, and HQ BRAC Legal Review. It was  
signed by the Director of the HFO.

2. Point of contact is Ms. Francine Cole, Hampton Field Office, DSN 680-4370,  
commercial (757) 788-4370.

Encl  
ECOP - LHAAP

  
THOMAS E. LEDRELE  
Director, Base Realignment  
and Closure

CF (w/encls)  
HQDA (DAIM-BD/ R. Ratcliff)  
SITE MANAGER, LHAAP (ATTN: ROSE M. ZEILER)

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## Acronyms and Abbreviations

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|        |                                                                       |
|--------|-----------------------------------------------------------------------|
| ACM    | asbestos-containing material                                          |
| AST    | above-ground storage tank                                             |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CERFA  | Community Environmental Response Facilitation Act                     |
| CFR    | Code of Federal Regulations                                           |
| DOD    | Department of Defense                                                 |
| DOI    | Department of the Interior                                            |
| EA     | environmental assessment                                              |
| EBS    | environmental baseline survey                                         |
| ECOP   | Environmental Condition of Property                                   |
| FFA    | Federal Facility Agreement                                            |
| LHAAP  | Longhorn Army Ammunition Plant                                        |
| LBP    | lead-based paint                                                      |
| MEC    | munitions and explosives of concern                                   |
| MOA    | Memorandum of Agreement                                               |
| NEPA   | National Environmental Policy Act                                     |
| NRHP   | National Register of Historic Places                                  |
| OE     | ordnance and explosives                                               |
| OSHA   | Occupational Safety and Health Administration                         |
| PCB    | polychlorinated biphenyl                                              |
| ppm    | parts per million                                                     |
| RCRA   | Resource Conservation and Recovery Act                                |
| TCEQ   | Texas Commission on Environmental Quality                             |
| TNRCC  | Texas Natural Resources Conservation Commission                       |
| USACE  | U.S. Army Corps of Engineers                                          |
| USEPA  | U.S. Environmental Protection Agency                                  |
| USFWS  | U.S. Fish and Wildlife Service                                        |
| UST    | underground storage tank                                              |

# ENVIRONMENTAL CONDITION OF PROPERTY I (ECOP)

Longhorn Army Ammunition Plant, Karnack, Texas  
April 2004

## 1.0 Purpose

The purpose of this Environmental Condition of Property (ECOP) is to document the environmentally related findings and conditions of approximately 5,935 acres of land with 15 facilities (herein after referred to as the Property) at the Longhorn Army Ammunition Plant (LHAAP). The Property will be transferred from Department of the Army control to another federal agency, the Department of the Interior (DOI), U.S. Fish and Wildlife Service (USFWS), consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §120(h), Army, and USFWS policy. In addition, the ECOP identifies use restrictions necessary to protect human health or the environment as specified in the attached Environmental Protection Provisions (**Attachment 2**).

## 2.0 Property Description

Longhorn Army Ammunition Plant is located in central-east Texas in the northeastern corner of Harrison County, between State Highway 43 at Karnack, Texas and the western shore of Caddo Lake (**Figure 1**). The Property proposed for transfer consists of approximately 5,935 acres of land with 14 facilities (however, the initial transfer to the USFWS consists of 5031.75 acres with 12 facilities) as summarized in **Table 1** and shown on **Figure 2**.

## 3.0 Environmental Condition of the Property

A determination of the environmental condition of the property was made based on the review of existing environmental documents and aerial photographs, and by completing the associated physical and visual inspection of the site and the properties immediately adjacent to the Property. Documents reviewed are listed in **Attachment 1**.

### 3.1 Environmental Condition of Property Categories

**Table 2** summarizes the Department of Defense (DOD) Environmental Condition of Property (ECOP) Categories. **Tables 3 and 4**, and **Figure 3** summarize and show environmental sites within and adjacent to the Property. The following are the facilities and acreage of land for each category included in the Property proposed for transfer:



Category 1: Facilities include Fuse/Detonation Magazine Installation (Building DST-3); two High Explosive Magazine Installations (Buildings BST-2 and BST-4); General Installation (Starr Ranch) (Building 99-Y); Administration General Purpose (Building 703-B); two Information Processing Centers (Buildings 703-D and 703-E); Administration General Purpose – Telephone Exchange Building (Building 702); Access Control Facility (Building 720-C); two Magazine Group Installations (Buildings 31-M and 35-M), the two buildings are not included in the initial transfer to the USFWS; and a Shed (Facility TS-12). Two additional facilities without numbers exist within the Property and include an Observation Enclosure located southeast of the former Building 44-T, and covered Grandstand Bleachers located in the immediate vicinity of Building 720-C.

One 10,000-gallon diesel oil underground storage tank (UST) was previously located south of former Building 703-C. The tank (703-C-1) was removed in 1993.

DOD revised the ECOP categories so that property may be classified as Category 1 if there was storage, but no release or disposal of the materials. Environmental sites LHAAP-9, -15, -34 and -57 that were originally classified as Category 2 are reclassified as Category 1 property. Approximately 5,502.03 acres of land are included in Category 1 property. The Warehouse Area will not be included in the initial transfer to the USFWS.

Category 3: Approximately 432.85 acres of land are included in Category 3 property. Environmental sites include LHAAP-1, -11, -13, -14, -45, -52, -63, and -70. Additional data evaluations are currently being performed for LHAAP-45 and the site will not be included in the initial transfer to the USFWS. LHAAP- 52 and -70 are located within the LHAAP-45 boundary, therefore, these two sites will also not be included in the initial transfer to the USFWS.

Category 4: One Category 4 environmental site is included in the proposed transfer; LHAAP-71. Approximately 0.01 acres of land is included in Category 4 property

### **3.2 Storage, Release, or Disposal of Hazardous Substances**

As a result of historical activities on the Property, hazardous substances were stored for one year or more, released, or disposed on the Property in excess of the reportable quantities listed in 40, C.F.R. Part 373. Notification of areas where hazardous substance storage, release, or disposal occurred is summarized in **Table 5**.

### **3.3 Storage, Release, or Disposal of Petroleum Products**

#### **3.3.1 Storage, Release, or Disposal of Petroleum (not in underground storage tanks or above-ground storage tanks)**

There is no evidence that any petroleum or petroleum products in excess of 55 gallons at one time were stored, released, or disposed of on the Property. Accordingly, there is no need for any notification of petroleum product storage, release, or disposal.

#### **3.3.2 Underground and Above-Ground Storage Tanks**

Current underground storage tank/above-ground storage tank (UST/AST) Sites: There were no USTs nor ASTs on the Property that are currently used for storage of petroleum products.

Former UST/AST Sites: There was one underground storage tank on the Property. Facility 703-C-1 consisted of one 10,000 gallon, single-walled steel diesel tank. The tank was installed in 1978 and removed June 1993. During tank removal, soil samples were collected from the sides and bottom of the tank pit for laboratory analysis. Soil samples were also collected from tank pit backfill material. The backfill soil exhibited a total petroleum concentration of 72.1 parts per million (ppm). The removed tank was disposed off site. Following completion of UST removal activities, the TNRCC issued a letter indicating that the UST removal action had been satisfactory and no further action was required for the site. Available information of the UST closure did not document the disposition method of the removed soil (**Attachment 3**). Notification of the area where petroleum product was stored in a UST is summarized in Table 6.

### **3.4 Polychlorinated Biphenyls**

Between May 1995 and March 1996 transformers within the Property were tested for polychlorinated biphenyl (PCB) contents. The results of the testing for the areas within the property are included in **Attachment 4**. All transformers containing PCBs above the action level of 50 ppm were removed from LHAAP. Based on a review of existing records and available information, there are currently no PCB-contaminated transformers located on the Property and no evidence of releases from PCB equipment. Some fluorescent light ballasts in the buildings may contain PCB in excess of 50 ppm. The Letter of Transfer will contain the fluorescent light ballasts PCB notification and covenant provided in the Environmental Protection Provisions (**Attachment 2**).

### **3.5 Asbestos**

Based on the Plant-Wide Asbestos-Containing Material (ACM) Survey Report (Pollution Management, 1995), several buildings on the Property contain friable and non-friable asbestos. **Table 7** summarizes the asbestos survey results for buildings containing ACM on the Property. Buildings that were surveyed and were found to contain no ACM are summarized in **Table 8**. ACM survey reports are included in **Attachment 5**. The Letter of Transfer will contain the

asbestos warning and covenant provided in the Environmental Protection Provisions (Attachment 2).

### **3.6 Lead-Based Paint**

Except for facility TS-12, all other facilities within the Property were built prior to 1978 and are therefore presumed to contain lead-based paint (LBP). The Letter of Transfer will contain the LBP notice and covenant provided in the Environmental Protection Provisions (Attachment 2).

### **3.7 Radiological Materials**

Based on a review of existing records and available information, there is no evidence that the U.S. Army generated, stored or disposed of radioactive materials or sources on the Property.

### **3.8 Radon**

Between 1989 and 1992, radon surveys were conducted for existing Buildings 702 and 703-D. Radon was not detected at or above the U.S. Environmental Protection Agency (USEPA) residential action level of 4 picoCuries per liter in either of the buildings. The Letter of Transfer will contain the Radon notice and covenant provided in the Environmental Protection Provisions (Attachment 2).

### **3.9 Munitions and Explosives of Concern**

Munitions and Explosives of Concern (MEC), which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (A) unexploded ordnance as defined in 10 U.S. Code 2710(e)(9); (B) discarded military munitions as defined in 10 U.S.C. 2710(e)(2); or (C) explosive munitions constituents (e.g., trinitrotoluene, cyclotrimethylene-trinitramine) present in high enough concentrations to pose an explosive hazard. Based on a review of existing records and available information, the Property is not known or suspected to contain ordnance and explosives (OE) (Engineering Environmental Management, 2002).

However, MEC may be present on adjoining property (LHAAP-27, -53 and -54) (Figure 3). The Letter of Transfer will contain the notice for the potential for the presence of MEC provided in the Environmental Protection Provisions (Attachment 2).

### **3.10 Adjacent Hazardous Conditions**

Sites adjacent to the Property include Category 1, 3, 5 and 6 sites. Remedial investigations/feasibility studies are currently ongoing for the Category 5 and 6 sites adjacent to the Property. There is no indication that potential contamination has migrated from the adjacent sites to the Property.

## **4.0 Remediation**

Remedial action was completed for site LHAAP 71. In the event remedial action is found to be necessary that has not been taken by the date of the transfer, the U. S. Army will conduct the appropriate remedial action. The Longhorn Army Ammunitions Plant Federal Facilities Agreement (FFA), effective as of December 30, 1991, by and between the Longhorn Army Ammunition Plant, the Texas Water Commission, and the United States Environmental Protection Agency applies to the Property. Currently, there are no environmental remediation orders applicable to the Property. The Army reserves the right to conduct remediation activities.

## **5.0 Groundwater Monitoring Wells**

The Property proposed for transfer contains 39 monitoring wells (one well, 11WW01 is not included in the initial transfer to the USFWS) as summarized in **Table 9** and shown on **Figure 4**. The Letter of Transfer will include the groundwater monitoring wells covenant and notice provided in the Environmental Protection Provisions (**Attachment 2**).

## **6.0 Potential Wetlands**

There are several areas at LHAAP that might be considered as wetlands. These are primarily low lying/floodplain areas associated with Goose Prairie Creek, Central Creek, Harrison Bayou and Saunders Branch. However, there has been no specific survey conducted at LHAAP to identify areas that would be classified as wetlands. **Figure 5** shows the streams, lakes and potential wetlands within the Property.

## **7.0 Endangered or Threatened Species**

No federal endangered or threatened species have been confirmed on the property proposed for transfer. However, LHAAP contains habitat identified as suitable for five (5) federal and/or state threatened species (CLI, 1995). Of the five (5) animal species that could potentially be present, information received from USFW (January 2003) and Texas Department of Parks and Wildlife (February 2003) identified the species known or suspected to occur in the vicinity of LHAAP as summarized in **Table 10**.

## **8.0 Archaeological Properties**

The Property proposed for transfer contains three known archaeological sites (41HS240, 41HS407, and 41HS484) that are potentially eligible for inclusion in the National Register of Historic Places (NRHP). Twenty-four other archaeological sites have been listed as either

potentially eligible or undetermined category and therefore justify protection pending further investigation. A total of twenty-seven (27) archaeological sites have been determined to possess the necessary attributes to make them eligible for protection or inclusion in the NRHP.

Archaeological sites were classified based on documentation contained in three reports referenced in Attachment 1 as follows: (1) Geo-Marine, 1996; (2) Gadus et al, 1998; and (3) Pertulla and Nelson, 1999. Additionally, the Cultural Resources Management Plan (Geo-marine 1996) stated that 24 archivally identified sites were on the LHAAP installation. The USFWS will honor its responsibilities under the National Historic Preservation Act and will coordinate all activities in furtherance of its responsibilities with the Texas State Historic Preservation Office, appropriate federally recognized tribes, and other interested parties. The letter of transfer will include the archaeological properties covenant and notice provided in the Environmental Protection Provisions (**Attachment 2**).

## **9.0 Regulatory/Public Coordination**

The USEPA Region 6, Texas Commission on Environmental Quality (TCEQ), U.S. Fish and Wildlife Service, and the public were provided copies of this ECOP. Additionally, Caddo Lake Institute was provided a courtesy copy. Public notice of the public comment period and the availability of the ECOP were made in the Shreveport Times and Marshall News Messenger newspapers on March 18, 2004. The comment period was between March 19 and April 18, 2004. All comments received during the comment period were review and incorporated where appropriate.

Regulatory comments were received from the USEPA Region 6: however, no comments were received from the TCEQ. In addition, the USFWS provided comments: however, no other comments were received from the public. All comments were reviewed and incorporated as appropriate. Based on USEPA Region 6 comments, the Warehouse Area and LHAAP-45 Area (including LHAAP-52 and -70) will not be included in the initial transfer to the USFWS. A copy of the response to comments is included as Attachment 6.

## **10.0 National Environmental Policy Act**

The environmental impacts associated with the proposed transfer of the Property have been analyzed in accordance with the National Environmental Policy Act (NEPA). The results of this analysis have been documented in the Record of Environmental Consideration (US Army 2004) which is in part supported by a Final Environmental Assessment (EA) for establishment of the Caddo Lake National Wildlife Refuge, prepared by the U.S. Fish and Wildlife Service on September 22, 2000.

## 11.0 Environmental Protection Provisions

On the basis of the above results from the EBS and other environmental studies and in consideration of the intended use of the Property, certain terms and conditions are required for the proposed transfer. These terms and condition will be set forth in the Environmental Protection Provisions (**Attachment 2**) and will be included in the Letter of Transfer.

## 12.0 Conclusion

Based on the above, the Property is determined to be suitable for transfer to the USFWS.

The U.S. Army remains responsible for the completion of the environmental program at LHAAP as provided in the Federal Facility Agreement.

APR 28 2004



Thomas E. Lederle  
Director, Hampton Field Office  
Army Base Realignment and Closure



***Tables***

**Table 1**  
**Facilities**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Bldg. No.         | Year Built | Area<br>(square feet) | Design Use Description                                       | Non-CERCLA<br>Issues |                | Remarks                                                                                                                                                                       |
|-------------------|------------|-----------------------|--------------------------------------------------------------|----------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |            |                       |                                                              | A                    | L <sup>a</sup> |                                                                                                                                                                               |
| DST-3             | 1953       | 58                    | Fuse/Detonation Magazine Installation                        |                      |                | The building is constructed of concrete walls and floor.                                                                                                                      |
| BST-2             | 1953       | 462                   | High Explosive Magazine Installation                         |                      |                | The building is constructed of concrete walls and floor.                                                                                                                      |
| BST-4             | 1953       | 58                    | High Explosive Magazine Installation                         |                      |                | The building is constructed of concrete walls and floor.                                                                                                                      |
| 99-Y              | 1956       | 1,565                 | General Installation Building –Starr Ranch                   |                      | X              | Presence of fluorescent light ballasts that may contain PCB.                                                                                                                  |
| TS-12             | 1983       |                       | Shed                                                         | X                    |                | The shed's walls and roof are constructed with corrugated transite siding on concrete slab.                                                                                   |
| None              | Unknown    | Unknown               | Grandstand Bleachers                                         |                      |                | The facility is located in the immediate vicinity of Building 720-C.                                                                                                          |
| None              | Unknown    | Unknown               | Observation Enclosure                                        |                      |                | The facility is located south east of the former Building 44-T.                                                                                                               |
| 703-B             | 1961       | 8,420                 | Administration General Purpose                               | X                    |                | The building has been renovated and freshly painted in 2002. Floor tile located in the building has been covered with carpet thus encapsulating asbestos containing material. |
| 703-D             | 1969       | 3,828                 | Information Processing Center                                | X                    | X              |                                                                                                                                                                               |
| 703-E             | 1971       | 1,921                 | Information Processing Center                                | X                    | X              |                                                                                                                                                                               |
| 702               | 1942       | 2,459                 | Administration General Purpose – Telephone Exchange Building | X                    | X              |                                                                                                                                                                               |
| 720-C             | 1942       | 302                   | Access Control Facility                                      | X                    |                |                                                                                                                                                                               |
| 31-M <sup>b</sup> | 1954       | 11,440                | Magazine Group Installation                                  | X                    |                |                                                                                                                                                                               |
| 35-M <sup>b</sup> | 1954       | 11,440                | Magazine Group Installation                                  | X                    |                |                                                                                                                                                                               |

Notes and Abbreviations:

A – Asbestos

L – Lead-based paint

<sup>a</sup> – Although it is presumed that all buildings constructed prior to 1978 contain lead-based paint, visual inspection of the buildings indicated LBP does not exist in some of the buildings.

<sup>b</sup> - The building will not be included in the initial transfer to the USFWS.

**Table 2**  
**Community Environmental Response Facilitation Act Categories and Codes**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Category                                       | Description                                                                                                                                                                                  |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category 1                                     | Areas where no release or disposal of hazardous substance or petroleum products has occurred (including no migration of these substances from adjacent areas)                                |
| Category 2                                     | Areas where only release or disposal of petroleum products has occurred                                                                                                                      |
| Category 3                                     | Areas where release, disposal, and/or migration of hazardous substance has occurred, but at concentrations that do not require a removal or remedial response                                |
| Category 4                                     | Areas where release, disposal, and/or migration of hazardous substance has occurred, and all removal or remedial actions to protect human health and the environment have been taken         |
| Category 5                                     | Areas where release, disposal, and/or migration of hazardous substance has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken |
| Category 6                                     | Areas where release, disposal, and/or migration of hazardous substance has occurred, but required actions have not yet been implemented                                                      |
| Category 7                                     | Areas that are not evaluated or require additional evaluation                                                                                                                                |
| <b>CERCLA Codes for Categories 2 through 7</b> |                                                                                                                                                                                              |
| HS                                             | Indicates hazardous substance storage                                                                                                                                                        |
| HR                                             | Indicates hazardous substance release and/or storage                                                                                                                                         |
| PR                                             | Indicates petroleum substance release and/or storage                                                                                                                                         |
| PS                                             | Indicates petroleum substance storage                                                                                                                                                        |
| (P)                                            | Indicates possible release or disposal, unverified by sampling or analysis                                                                                                                   |

Abbreviations:

CERCLA    *Comprehensive Environmental Response, Compensation, and Liability Act*

**Table 3**  
**Environmental Sites**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site                                                          | Brief Description                                                                                                                                                                                              | CERFA Category | Findings                                                                                                                                                                                                                                                     | Documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LHAAP-1 (Inert Burning Grounds)                               | A 10-acre area was used for burning trash, ashes, scrap lumber, and waste from burned 2,4,6- TNT. During the 1950s the site was used to burn photoflash powder and other discarded materials.                  | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. A ROD for no further action was signed January 1998.                                                      | Sverdrup Environmental, Inc., 1997, Remedial Investigation Report, Group 1 Sites, Volume 1-2, May.<br><br>Letter from Chris Villarreal (USEPA Region 6) to James McPherson (LHAAP): Record of Decision for No Further Action at Group 1 Sites, LHAAP, dated January 26, 1998.<br><br>Engineering Environmental Management, Inc., 2002, Final U.S. Army Closed, Transferring, and Transferred Range/Site Inventory for LHAAP, Texas, September.                                                                                                                                       |
| LHAAP-9 (Building 31-W - Drum Storage)                        | Building 31-W was a storage area for containers of liquid hazardous waste, PCBs and various chemicals from early 1950s to 1955. The site was closed in 1999. Building 31-W was demolished.                     | 1 <sup>a</sup> | Preliminary site assessment to determine evidence of release, exposure potential and migration pathways have been completed. Results indicated that there was no evidence of contamination. In 1999, the site was closed in accordance with RCRA guidelines. | Maley, Don, 1988, Potential Hazardous Waste Site Preliminary Assessment, USEPA Form 2070-12, April<br><br>Texas Water Commission, 1988, Final Report RCRA Facility Assessment (RFA), LHAAP-1 through LHAAP-34, LHAAP, Marshal, Texas, April.<br><br>Complete Environmental Services, 1999, Final Closure Report, Hazardous Waste Storage Area 31-W RCRA Permit 50195 Unit No. 001, LHAAP, October<br><br>Texas Commission on Environmental Quality, 2003, Notice of Registration, Industrial and Hazardous Waste, LHAAP, November 19, Page 36                                        |
| LHAAP-11 (Suspected TNT Burial LHAAP- at Ave P & Q)           | A 10-acre area just north of Avenue Q, bounded by Avenue P on the west may have been used for disposal of bulk TNT during the 1940s. There is no confirmed documentation that TNT burial occurred at the site. | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. A ROD for no further action was signed January 1998.                                                      | Sverdrup Environmental, Inc., 1997, Remedial Investigation Report, Group 1 Sites, Volume 1-2, May.<br><br>Letter from Chris Villarreal (USEPA Region 6) to James McPherson (LHAAP): Record of Decision for No Further Action at Group 1 Sites, LHAAP, dated January 26, 1998.                                                                                                                                                                                                                                                                                                        |
| LHAAP-13 (Suspected TNT Burial between Active & Old Landfill) | It is suspected that TNT or waste acids may have been disposed sometime at this site during the history of the installation.                                                                                   | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. A ROD for no further action was signed February 1996.                                                     | USACE, Tulsa District, 1995, Final Remedial Investigation/Feasibility Study Sites 13 and 14 (Volumes I-III), LHAAP, June.<br><br>USACE, 1995, Proposed Plan of Action Sites 13 and 14 (Group 3), LHAAP, Marshal, Texas, June.<br><br>Letter from TNRCC to Director Superfund Division, USEPA: Record of Decision Concurrence for LHAAP Sites 13 & 14 at LHAAP dated October 1995.<br><br>Letter from Michael Moore, RI/FS Unit, Superfund Division to Lisa Price, USEPA: Transmittal of Record of Decision for No Further Action at LHAAP Sites 13 & 14 at LHAAP dated October 1995. |

**Table 3 (Continued)**  
**Environmental Sites**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site                             | Brief Description                                                                                                                                                                                                                                          | CERFA Category | Findings                                                                                                                                                                                                                                                     | Documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LHAAP-14 (Area 54 Burial Ground) | The disposal site is reportedly beneath the asphalt parking area adjacent to Building 49-W. It is suspected that demolition debris, building rubble, explosives, and acidic wastes were disposed during 1940s and 1950s.                                   | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. A ROD for no further action was signed February 1996.                                                     | <p>USACE, Tulsa District, 1995, Final Remedial Investigation/Feasibility Study Sites 13 and 14 (Volumes I-III), LHAAP, June.</p> <p>USACE, 1995, Proposed Plan of Action Sites 13 and 14 (Group 3), LHAAP, Marshall, Texas, June.</p> <p>Letter from TNRCC to Director Superfund Division, USEPA: Record of Decision Concurrence for LHAAP Sites 13 &amp; 14 at LHAAP dated October 1995.</p> <p>Letter from Michael Moore, RI/FS Unit, Superfund Division to Lisa Price, USEPA: Transmittal of Record of Decision for No Further Action at LHAAP Sites 13 &amp; 14 at LHAAP dated October 1995.</p> <p>Engineering Environmental Management, Inc., 2002, Final U.S. Army Closed, Transferring, and Transferred Range/Site Inventory for LHAAP, Texas, September.</p> |
| LHAAP-15 (Area 49W Drum Storage) | The site is a drummed waste storage shed containing solid and hazardous waste. It consists of a metal building 50 by 100 feet by 10/16 feet (sloped), with a concrete floor. The site was in operation from 1984 to 1999. The storage shed was demolished. | 1 <sup>a</sup> | Preliminary site assessment to determine evidence of release, exposure potential and migration pathways have been completed. Results indicated that there was no evidence of contamination. In 1999, the site was closed in accordance with RCRA guidelines. | <p>Texas Water Commission, 1988, Final Report RCRA Facility Assessment (RFA), LHAAP-1 through LHAAP-34, LHAAP, Marshal, Texas, April.</p> <p>Maley, Don, 1988, Potential Hazardous Waste Site Preliminary Assessment, USEPA Form 2070-12, April.</p> <p>CES, 1999, Final Closure Report, Hazardous Waste Storage Area 49-W, RCRA Permitted Unit No. 002, LHAAP, September.</p> <p>Texas Commission on Environmental Quality, 2003, Notice of Registration, Industrial and Hazardous Waste, LHAAP, November 19, Page 36</p>                                                                                                                                                                                                                                            |

**Table 3 (Continued)**  
**Environmental Sites**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site                                          | Brief Description                                                                                                                                                                                                                                                                                                                                                                                            | CERFA Category | Findings                                                                                                                                                                                                                                                                                                                                                                                                                        | Documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LHAAP-34 (Building 701 PCB Storage)           | The site consists of Building 701 that was used for storage of PCB-contaminated material from 1980 to 1984. The contaminated material from the cleanup of transformer spills was stored in 30- and 55-gallon drums in the north end of the building. The storage area was a wooden framed building with shingles and a concrete floor approximately 25 x 110 feet in dimension. Building 701 was demolished. | 1 <sup>a</sup> | Preliminary site assessment to determine evidence of release, exposure potential and migration pathways have been completed. Results indicated that there was no evidence of contamination. In 2000, the site was closed in accordance with RCRA guidelines.                                                                                                                                                                    | Complete Environmental Services, 2000, Closure Report TNRCC Solid Waste Registration No. 30990, NOR Waste Management Unit No. 009, Building 701, LHAAP, April<br><br>Maley, Don, 1988, Potential Hazardous Waste Site Preliminary Assessment, USEPA Form 2070-12, April.<br><br>Texas Commission on Environmental Quality, 2003, Notice of Registration, Industrial and Hazardous Waste, LHAAP, November 19, Page 37                                                                                                                                                                                |
| LHAAP-45 <sup>b</sup> (Magazine Area)         | The site was used for storage of munitions. The total enclosed area is over 800 acres; within this area are 58 bunkers, 3 magazine buildings in the northeast corner, and 2 buildings. Each bunker consists of three concrete walls and a concrete-floored structure 26 x 60 x 10 feet, with a wooden roof and doors. Operated from 1942 until 1995.                                                         | 3              | Initial soil investigation results indicated that several compounds (arsenic, cadmium, lead, pentachlorophenol and perchlorate) were present at the site. However, additional soil sampling results indicated that metals detected were within background values and the site required no further action.<br><br>The site is currently undergoing further consideration of the appropriate environmental condition of property. | Maley, Don, 1988, Potential Hazardous Waste Site Preliminary Assessment, USEPA Form 2070-12, April.<br><br>USACHPPM, 2000, Hazardous and Medical Waste Study No. 37-EF-5506-00 Response Complete Verification and Relative Risk Site Evaluation for LHAAP, Volumes I & II, 10-12 July.<br><br>USFWS, 2003, Contaminants Investigation of Northern Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas, November.                                                                                                                                                            |
| LHAAP-52 <sup>b</sup> (Magazine Area Washout) | The area contains 58 Richmond-type magazines and two aboveground magazines, all of which were used for storage of TNT. A standpipe in the area was used to wash out trucks used for TNT transportation.                                                                                                                                                                                                      | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. No further action is required for the site.                                                                                                                                                                                                                                  | USACE, 1995, Site Investigation, LHAAP, Preliminary Scope of Investigations Group 5 Sites, February.<br><br>Sverdrup Environmental, Inc., 1997, Final Site Characterization Investigation Report, Group 5 Sites (50, 52, 60, and 63) at the LHAAP, Karnack, Texas, June.<br><br>Letter from W.K Honker (Superfund Division) to James McPherson (LHAAP): Group 5 Final Site Characterization Investigation Report dated May 11, 1998.<br><br>Letter from Chris Villarreal (USEPA) to David Tolbert (LHAAP): Concurrence Group 5 Final Site Characterization Investigation Report dated May 12, 1998. |



**Table 3 (Continued)**  
**Environmental Sites**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site                                                | Brief Description                                                                                                                                                                                                                                | CERFA Category | Findings                                                                                                                                                                                                                                                                                                                                                                          | Documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LHAAP-57 (Rubble Burial LHAAP-)                     | The site is used for burial of inert materials that were cleared from property after acquisition.                                                                                                                                                | 1 <sup>a</sup> | Preliminary site assessment to determine evidence of release, exposure potential and migration pathways have been completed. Results indicated that there was no evidence of contamination. The site was recommended for no further investigation.                                                                                                                                | USACE, 1995, Final DERPMS/RMIS Resolution Document, LHAAP, June.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LHAAP-63 (Burial Pits)                              | Pits are located along Bobby Jones Road, approximately 30 meters north of Long Point Road, and east of the explosive burning ground. The pits were used in the late 1950s for the detonation of Plant 3 reject materials of unknown composition. | 3              | Investigation results indicated that no chemicals associated with the site present an unacceptable risk to either human health or the environment. No further action is required for the site.                                                                                                                                                                                    | Sverdrup Environmental, Inc., 1997, Final Site Characterization Investigation Report, Group 5 Sites (50, 52, 60, and 63) at the LHAAP, Karnack, Texas, June.<br><br>Letter from W.K Honker (Superfund Division) to James McPherson (LHAAP): Group 5 Final Site Characterization Investigation Report dated May 11, 1998.<br><br>Letter from Chris Villarreal (USEPA) to David Tolbert (LHAAP): Concurrence Group 5 Final Site Characterization Investigation Report dated May 12, 1998. |
| LHAAP-70 <sup>b</sup> (Loading Dock Magazine Areas) | On December 18, 1952, improperly stacked 23-kilogram fiberboard boxes of TNT fell in magazine area 811-50, resulting in the spill of a large quantity of TNT and the injury of a workman.                                                        | 3              | A site inspection was conducted in 1995. There was no visual evidence of contamination from TNT or related compounds during the inspection. The documentation of the site indicated the boxed TNT was in solid "flake" form and was likely swept clean of excess particles. It was determined that no further site investigation was necessary for the site.                      | USACE, 1995, Site Investigation, LHAAP, Preliminary Scope of Investigations Group 5 Sites, February.<br><br>Sverdrup Environmental, Inc., 1995, Final Work Plan for the Preliminary Assessment Site Investigations, Group 5 Sites (50, 52, 60, and 63) at the LHAAP, Karnack, Texas, September.                                                                                                                                                                                         |
| LHAAP-71 (Oil Spill at Building 813)                | An oil tank spill occurred at Building 813 in December 1978. The spill was contained before it reached Central Creek.                                                                                                                            | 4              | A site inspection of Building 813 and the surrounding area was made in 1995. The inspection indicated no evidence of surface contamination. No soil stains or sheens were noted. It is likely that any residual fuel contamination from the incident have been naturally bioremediated since 1978 when the spill occurred. The site was recommended for no further investigation. | USACE, 1995, Site Investigation, LHAAP, Preliminary Scope of Investigations Group 5 Sites, February.<br><br>Sverdrup Environmental, Inc., 1995, Final Work Plan for the Preliminary Assessment Site Investigations, Group 5 Sites (50, 52, 60, and 63) at the LHAAP, Karnack, Texas, September.                                                                                                                                                                                         |

**Table 3 (Continued)**  
**Environmental Sites**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site                        | Brief Description                                                                                            | CERFA Category | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Documentation                                                                                                                                                                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Facility 703-C-1            | One 10,000-gallon single-walled, steel diesel underground storage tank installed in 1978 and removed in 1993 | 4              | During tank removal, soil samples were collected from the sides and bottom of the tank pit for laboratory analysis. Soil samples were also collected from tank pit backfill material. The backfill soil exhibited a total petroleum concentration of 72.1 parts per million (ppm). The removed tank was disposed off site. Available information of the UST closure did not document the disposition method of the removed soil. Following completion of UST removal activities, the TNRCC issued a letter indicating that the UST removal action had been satisfactory and no further action was required for the site. | Letter from Mark Jones (Pump Master, Inc) to Texas Water Commission: Subsurface Contamination at LHAAP, Facility ID No. 5555, dated August 23, 1993.<br><br>Letter from Mike Brashear (TNRCC) to Chris Roddam (LHAAP): Final review of UST Activity Report, UST No. 5555, LHAAP, dated February 2, 1994. |
| Warehouse Area <sup>b</sup> |                                                                                                              |                | The site is currently undergoing further consideration of the appropriate environmental condition of property. Additional evaluation of data will be performed for the site.                                                                                                                                                                                                                                                                                                                                                                                                                                             | USACHPPM, 2000, Hazardous and Medical Waste Study No. 37-EF-5506-00 Response Complete Verification and Relative Risk Site Evaluation for LHAAP, Volumes I & II, 10-12 July.                                                                                                                              |

Notes and Abbreviations:

<sup>a</sup> Site was previously classified as Category 2

<sup>b</sup> The site will not be included in the initial transfer to the USFWS

CERFA Community Environmental Response Facilitation Act

**Table 4**  
**Adjacent Properties**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site No. | Site Name                        | CERFA Category |
|----------|----------------------------------|----------------|
| LHAAP 12 | Landfill 12                      | 5              |
| LHAAP 16 | Landfill 16                      | 5              |
| LHAAP 19 | Constructions Materials Landfill | 1              |
| LHAAP 27 | South Test Area/Bomb Test Area   | 3              |
| LHAAP 29 | Former TNT Production Area       | 6              |
| LHAAP 46 | Plant 2 Area                     | 6              |
| LHAAP 47 | Plant 3 Area                     | 6              |
| LHAAP 48 | Y-Area                           | 6              |
| LHAAP 53 | Static Test Area                 | 6              |
| LHAAP 54 | Ground Signal Test Area          | 3              |
| LHAAP 58 | Maintenance Complex              | 6              |

Abbreviations:

CERFA    Community Environmental Response Facilitation Act

**Table 5**  
**Notification of Hazardous Substance Storage, Release, and Disposal**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Site No.              | Site Name                      | Name of Hazardous Substance(s)                                                                                                                                                                     | Date of Storage, Release, or Disposal                                                                                               | Remarks                                                                                    |
|-----------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| LHAAP 09              | Building 31W - Drum Storage    | Toxic and/or flammable liquid waste including oils (non-PCB), solvents, adhesives, antifreeze, Hycar/MEK, kerosene, mercury, acid, silver, and DAPT. PCB stored in the past (1950s until unknown). | Used for liquid waste storage in the early 1950's and for hazardous waste storage from 1984 until 1999. Building 31 was demolished. | Hazardous substance stored only, no release.                                               |
| LHAAP 15              | Area 49W - Drum Storage        | Brine sludge, oil contaminated material, batteries, adhesives and dirt, contaminated dirt, mercury and dirt, ash                                                                                   | Period of operation is 1984 until 1999. The storage shed was demolished.                                                            | Hazardous substance stored only, no release.                                               |
| LHAAP 34              | Building 701 - PCB Storage     | PCB-contaminated solid material (mostly soil) from spill cleanup                                                                                                                                   | Operated from 1980 until 1984. Building 701 was demolished.                                                                         | Hazardous substance stored only, no release.                                               |
| LHAAP 45 <sup>a</sup> | Magazine Area                  | Munitions products determined to be unsuitable.                                                                                                                                                    | Period of operation is 1942 until 1995                                                                                              | Munitions products are dry and are canned in weatherproof packing. No release at the site. |
| LHAAP 70 <sup>a</sup> | Loading Dock/<br>Magazine Area | Trinitrotoluene (TNT) and explosives                                                                                                                                                               | Dates of operation unknown but located within LHAAP-45, which operated from 1942 until 1995                                         | Hazardous substance stored only, no release.                                               |

Abbreviations:

<sup>a</sup> - The site will not be included in the initial transfer

DAPT    diacetyl, pentamethylene tetramine  
PCB     polychlorinated biphenyls  
TNT     trinitrotoluene

**Table 6**  
**Notification of Petroleum Product Storage, Release and Disposal**  
**Longhorn Army Ammunition Plant**

| Facility No. | Name of Petroleum Product | Date of Storage, Release, or Disposal                                                                          | Remedial Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|---------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 703-C-1      | Diesel                    | One 10,000-gallon, single walled steel underground storage tank was installed in 1978 and was removed in 1993. | During tank removal, soil samples were collected from the sides and bottom of the tank pit for laboratory analysis. Soil samples were also collected from tank pit backfill material. The backfill soil exhibited a total petroleum concentration of 72.1 parts per million (ppm). Available information of the UST closure did not document the disposition method of the removed soil. The removed tank was disposed off site. Following completion of UST removal activities, the TNRCC issue a letter indicating that the UST removal action had been satisfactory and no further action was required for the site. |

**Table 7**  
**Summary of Asbestos-Containing Materials Building Survey**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Building Number   | Year Built | Description                                                  | Description & Location of ACM                                                                                                                            | Condition of ACM |
|-------------------|------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 703-B             | 1961       | Administration General Purpose                               | Non-friable presumed asbestos containing 9 x 9-inch floor tile is located in the building.                                                               | Good             |
| 703-D             | 1969       | Information Processing Center                                | Non-friable presumed asbestos containing 12 x 12 and 9 x 9-inch floor tile is located in building.                                                       | Good             |
| 720-C             | 1942       | Access Control Facility                                      | Non-friable presumed asbestos containing 12 x 12-inch floor tile throughout building and non-friable presumed asbestos containing tar shingle roof.      | Good             |
| 702               | 1942       | Administration General Purpose – Telephone Exchange Building | Friable presumed asbestos containing steam-line joint insulation. Located on pipe fittings in building.                                                  | Damaged          |
|                   |            |                                                              | Non-friable presumed asbestos containing 9 x 9-inch floor tile throughout building.                                                                      | Good             |
| 31-M <sup>a</sup> | 1954       | Magazine Group Installation                                  | Non-friable presumed asbestos containing corrugated transite siding and non-friable presumed asbestos containing corrugated transite siding on the roof. | Good             |
| 35-M <sup>a</sup> | 1954       | Magazine Group Installation                                  | Non-friable presumed asbestos containing corrugated transite siding and non-friable presumed asbestos containing corrugated transite siding on the roof. | Damaged          |
| TS-12             | 1983       | Shed                                                         | Non-friable presumed asbestos containing corrugated transite siding on the walls and roof.                                                               | Good             |

<sup>a</sup> -- The building will not be included in the initial transfer



**Table 8**  
**Buildings with No Asbestos-Containing Material**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

| Building No. | Design Use Description               |
|--------------|--------------------------------------|
| BST-2        | High Explosive Magazine Installation |
| BST-4        | High Explosive Magazine Installation |

**Table 9**  
**Groundwater Monitoring Wells**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

|    | Monitoring Well Identification | Site Number | Site Name                                     | Easting<br>(Texas State Plane NAD83) | Northing<br>(Texas State Plane NAD83) |
|----|--------------------------------|-------------|-----------------------------------------------|--------------------------------------|---------------------------------------|
| 1  | 104                            | LHAAP 1     | Inert Burning Grounds                         | 3303302.20                           | 6961318.65                            |
| 2  | 106                            | None        | None                                          | 3316577.10                           | 6959206.74                            |
| 3  | 107                            | None        | None                                          | 3316648.96                           | 6957716.50                            |
| 4  | 108                            | None        | None                                          | 3320614.57                           | 6957140.85                            |
| 5  | 110                            | None        | None                                          | 3313731.36                           | 6944349.14                            |
| 6  | 111                            | None        | None                                          | 3302151.26                           | 6951524.75                            |
| 7  | 112                            | None        | None                                          | 3298907.02                           | 6957034.57                            |
| 8  | 128                            | LHAAP 54    | Ground Signal Test Area                       | 3317706.29                           | 6951109.72                            |
| 9  | 133                            | None        | None                                          | 3301925.48                           | 6963797.84                            |
| 10 | 134                            | None        | None                                          | 3301917.37                           | 6963792.20                            |
| 11 | C-10                           | None        | None                                          | 3317574.56                           | 6952228.54                            |
| 12 | G4WW01                         | LHAAP 67    | Above Ground Storage Tank                     | 3311444.82                           | 6956911.40                            |
| 13 | G4WW02                         | LHAAP 67    | Above Ground Storage Tank                     | 3311390.65                           | 6957060.76                            |
| 14 | G4WW03                         | LHAAP 67    | Above Ground Storage Tank                     | 3311534.45                           | 6957010.74                            |
| 15 | LHSMW61                        | None        | None                                          | 3313184.94                           | 6958547.74                            |
| 16 | LHSMW70                        | None        | None                                          | 3316533.17                           | 6958033.52                            |
| 17 | LHSMW71                        | None        | None                                          | 3316839.63                           | 6958207.89                            |
| 18 | 01MW01                         | LHAAP 1     | Inert Burning Grounds                         | 3302826.35                           | 6962068.19                            |
| 19 | 01MW02                         | LHAAP 1     | Inert Burning Grounds                         | 3302931.97                           | 6961959.87                            |
| 20 | 01MW03                         | LHAAP 1     | Inert Burning Grounds                         | 3303207.54                           | 6961728.83                            |
| 21 | 01MW04                         | LHAAP 1     | Inert Burning Grounds                         | 3302928.94                           | 6961538.82                            |
| 22 | 01MW05                         | LHAAP 1     | Inert Burning Grounds                         | 3303104.52                           | 6961293.42                            |
| 23 | 01WW01                         | LHAAP 1     | Inert Burning Grounds                         | 3303443.13                           | 6961674.26                            |
| 24 | 11WW01 <sup>a</sup>            | LHAAP 11    | Suspected TNT Burial Site at<br>Avenues P & Q | 3310037.00                           | 6953339.00                            |
| 25 | 11WW02                         | LHAAP 11    | Suspected TNT Burial Site at<br>Avenues P & Q | 3310131.66                           | 6953412.41                            |

**Table 9 (Continued)**  
**Groundwater Monitoring Wells**  
**Longhorn Army Ammunition Plant, Karnack, Texas**

|    | Monitoring Well Identification | Site Number | Site Name                                                     | Easting<br>(Texas State Plane NAD83) | Northing<br>(Texas State Plane NAD83) |
|----|--------------------------------|-------------|---------------------------------------------------------------|--------------------------------------|---------------------------------------|
| 26 | 11WW03                         | LHAAP 11    | Suspected TNT Burial Site at Avenues P & Q                    | 3310180.90                           | 6953340.75                            |
| 27 | 13WW01                         | LHAAP 13    | Suspected TNT Burial between Active Landfill and Old Landfill | 3312375.40                           | 6952944.21                            |
| 28 | 14MW01                         | LHAAP 14    | Area 54 Burial Ground                                         | 3312742.39                           | 6952625.09                            |
| 29 | 16WW05                         | LHAAP 16    | Landfill 16                                                   | 3313009.57                           | 6953204.38                            |
| 30 | 16WW06                         | LHAAP 16    | Landfill 16                                                   | 3313013.08                           | 6953191.59                            |
| 31 | 16WW31                         | LHAAP 16    | Landfill 16                                                   | 3314323.98                           | 6954133.31                            |
| 32 | 16WW32                         | LHAAP 16    | Landfill 16                                                   | 3314330.55                           | 6954127.67                            |
| 33 | 16WW33                         | LHAAP 16    | Landfill 16                                                   | 3314117.09                           | 6954043.06                            |
| 34 | 16WW34                         | LHAAP 16    | Landfill 16                                                   | 3314119.31                           | 6954036.01                            |
| 35 | 35AWW04                        | LHAAP 58    | Maintenance Complex                                           | 3304656.30                           | 6959446.59                            |
| 36 | 47WW22                         | LHAAP 47    | Plant 3 Area                                                  | 3311719.32                           | 6959044.08                            |
| 37 | 67WW04                         | LHAAP 67    | Above Ground Storage Tank                                     | 3311586.70                           | 6956544.30                            |
| 38 | 67WW06                         | LHAAP 67    | Above Ground Storage Tank                                     | 3311723.67                           | 6956895.21                            |
| 39 | 67WW07                         | LHAAP 67    | Above Ground Storage Tank                                     | 3311717.55                           | 6956892.51                            |

Abbreviations:

<sup>a</sup> - Well is located on the property that will not be included in the initial transfer to the USFWS

NAD83 North American Datum 1983

**Table 10**  
**Federal and State Listing of Threatened Species and State Species of Concern**  
**In the Vicinity of Longhorn Army Ammunition Plant, Karnack, Texas**

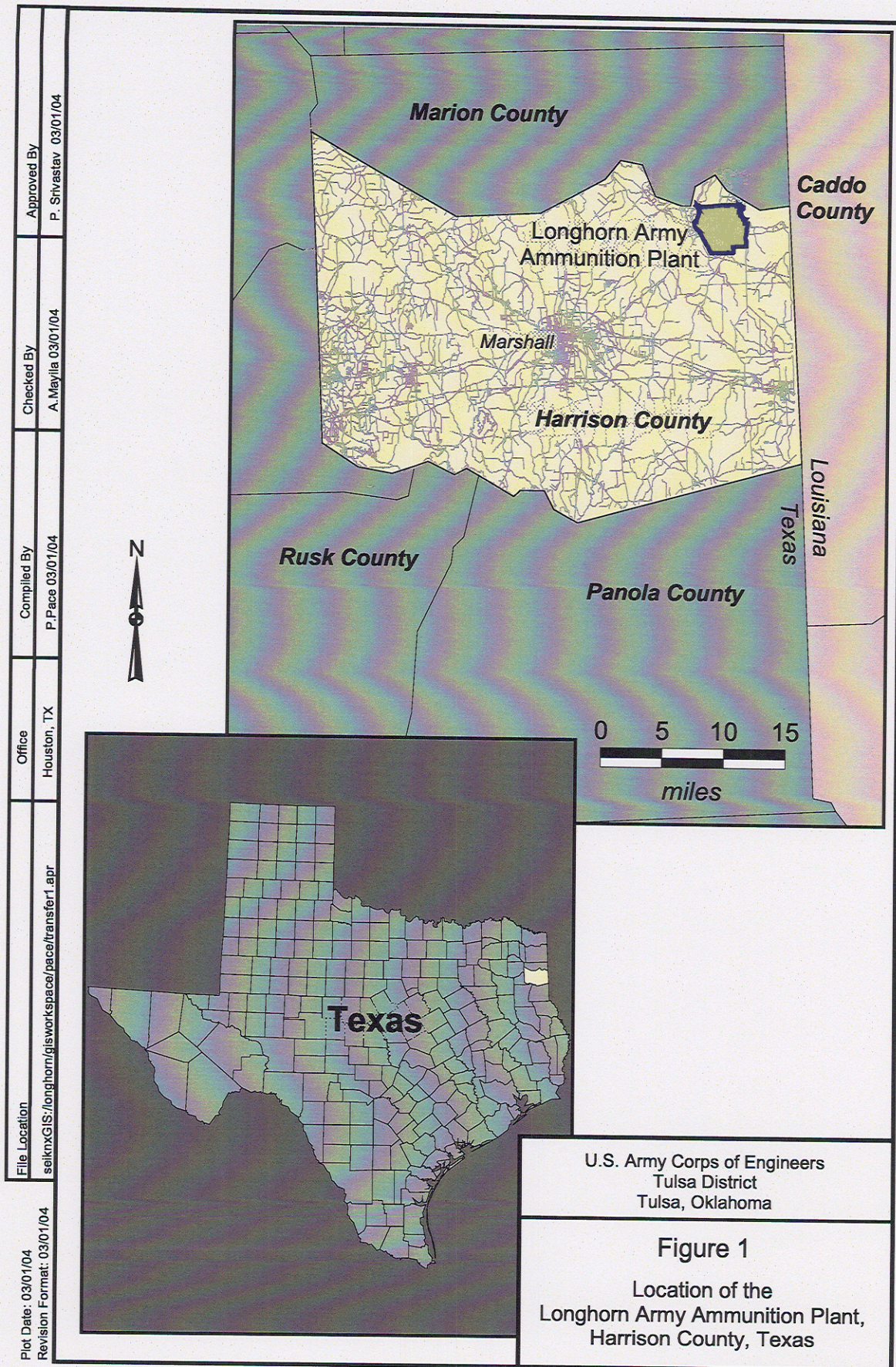
| FEDERAL LISTED THREATENED SPECIES                       |
|---------------------------------------------------------|
| Bald Eagle                                              |
| Louisiana Black Bear                                    |
| STATE LISTED THREATENED SPECIES                         |
| Louisiana Black Bear                                    |
| Alligator Snapping Turtle                               |
| Bluehead Shiner                                         |
| STATE SPECIES OF CONCERN                                |
| Southern Lady's Slipper                                 |
| STATE SPECIAL FEATURE/NATURAL COMMUNITIES/MANAGED AREAS |
| Colonial Waterbird Rookeries                            |
| Bald Cypress-Water Tupelo Series                        |
| Shortleaf Pine-Oak Series                               |
| Water Oak-Willow Oak Series                             |
| Caddo Lake State Park                                   |

Notes:

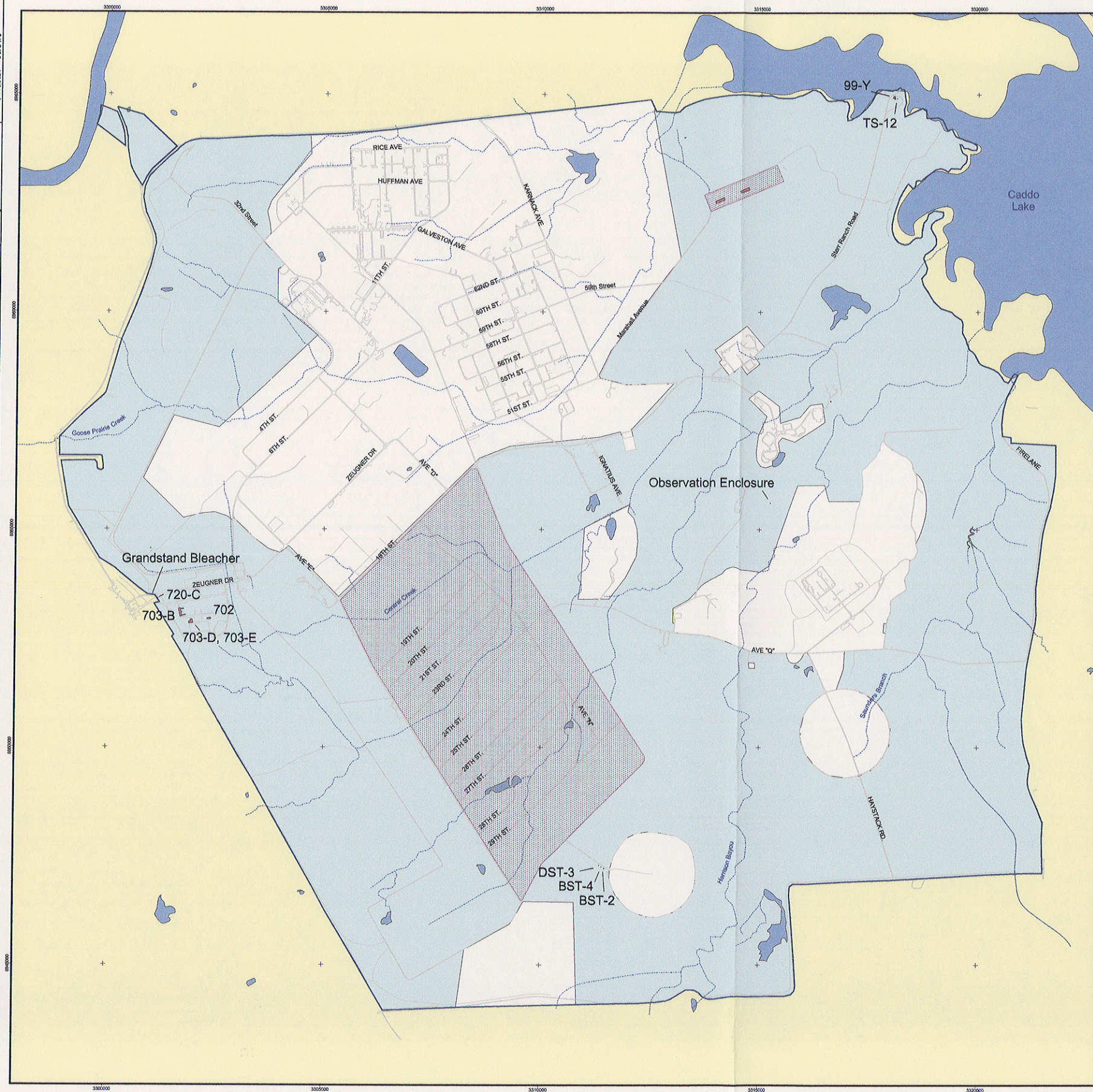
Source: Caddo Lake Institute, 1995, *Initial Species Inventory for Longhorn Army Ammunition Plant, Karnack, Texas, June*.

***Figures***



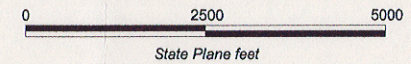






Legend:

- Creek/Bayou
- Road
- Approximate Boundary of Longhorn Army Ammunition Plant
- Water Body
- Facility to be Transferred
- Property to be Transferred
- Area Excluded from Initial Transfer
- Areas Excluded from Proposed Transfer
- Off Site



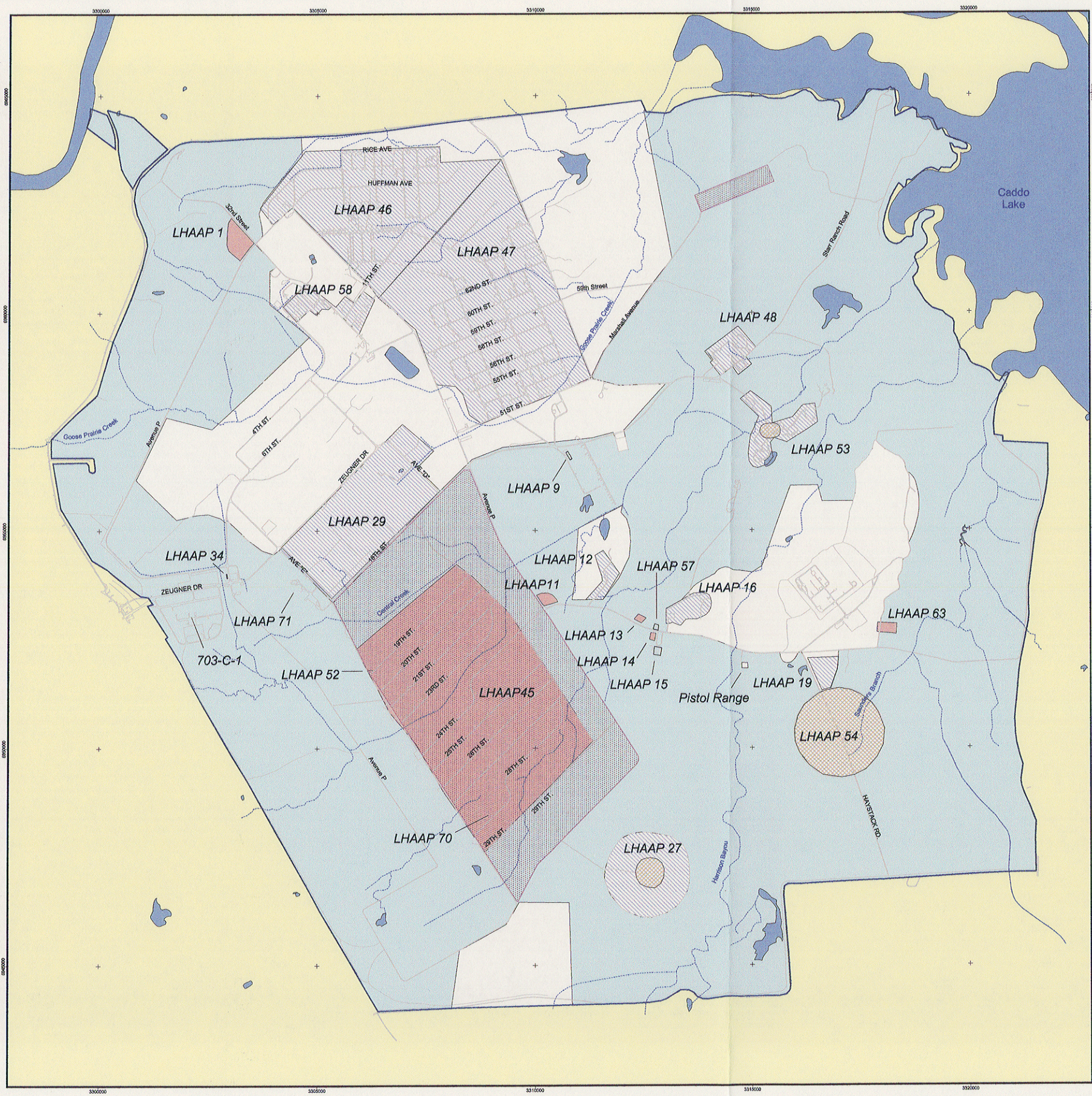
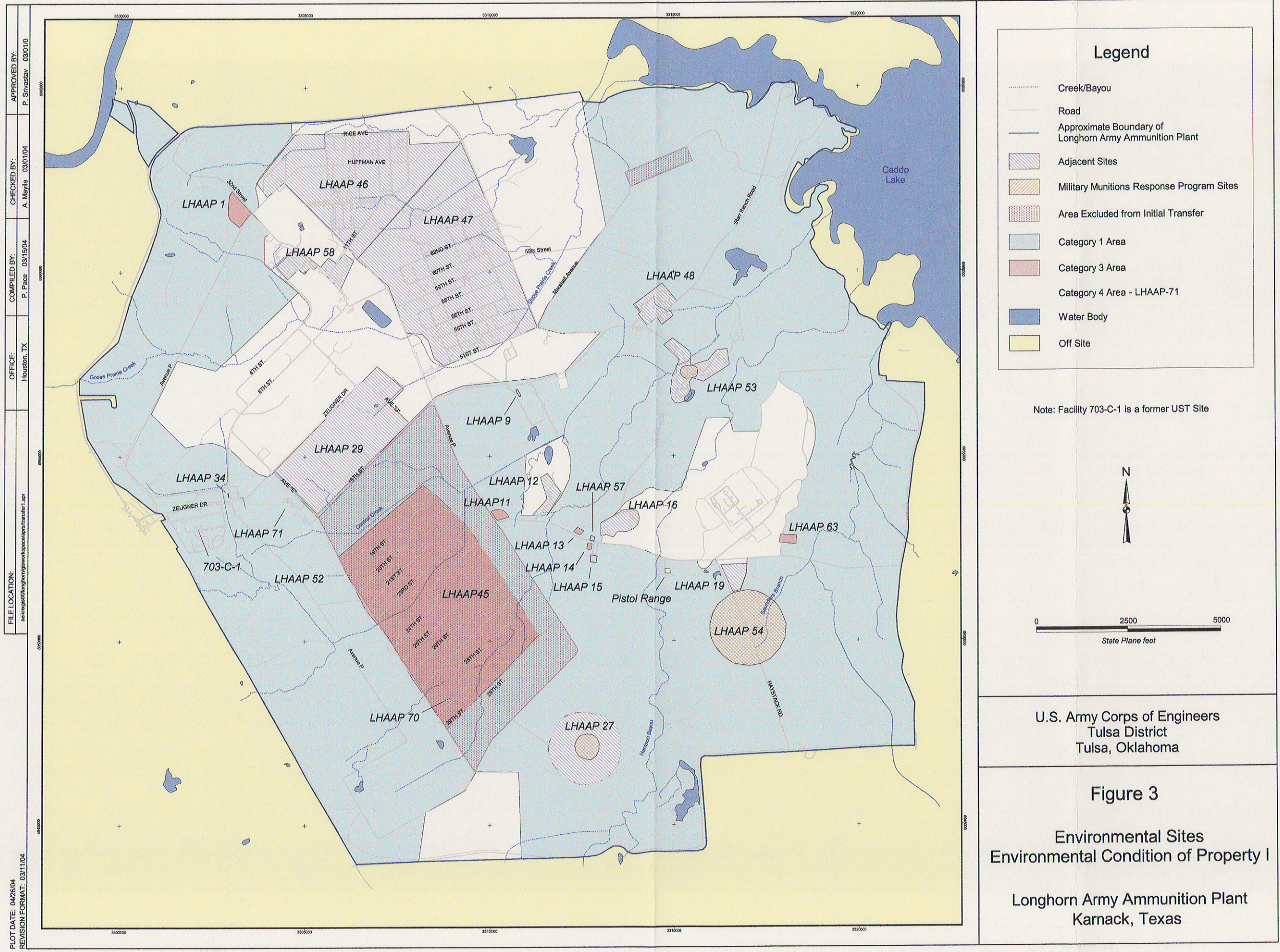
U.S. Army Corps of Engineers  
Tulsa District  
Tulsa, Oklahoma

Figure 2

Site Map  
Environmental Condition of Property I

Longhorn Army Ammunition Plant  
Karnack, Texas







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OFFICE: Houston, TX

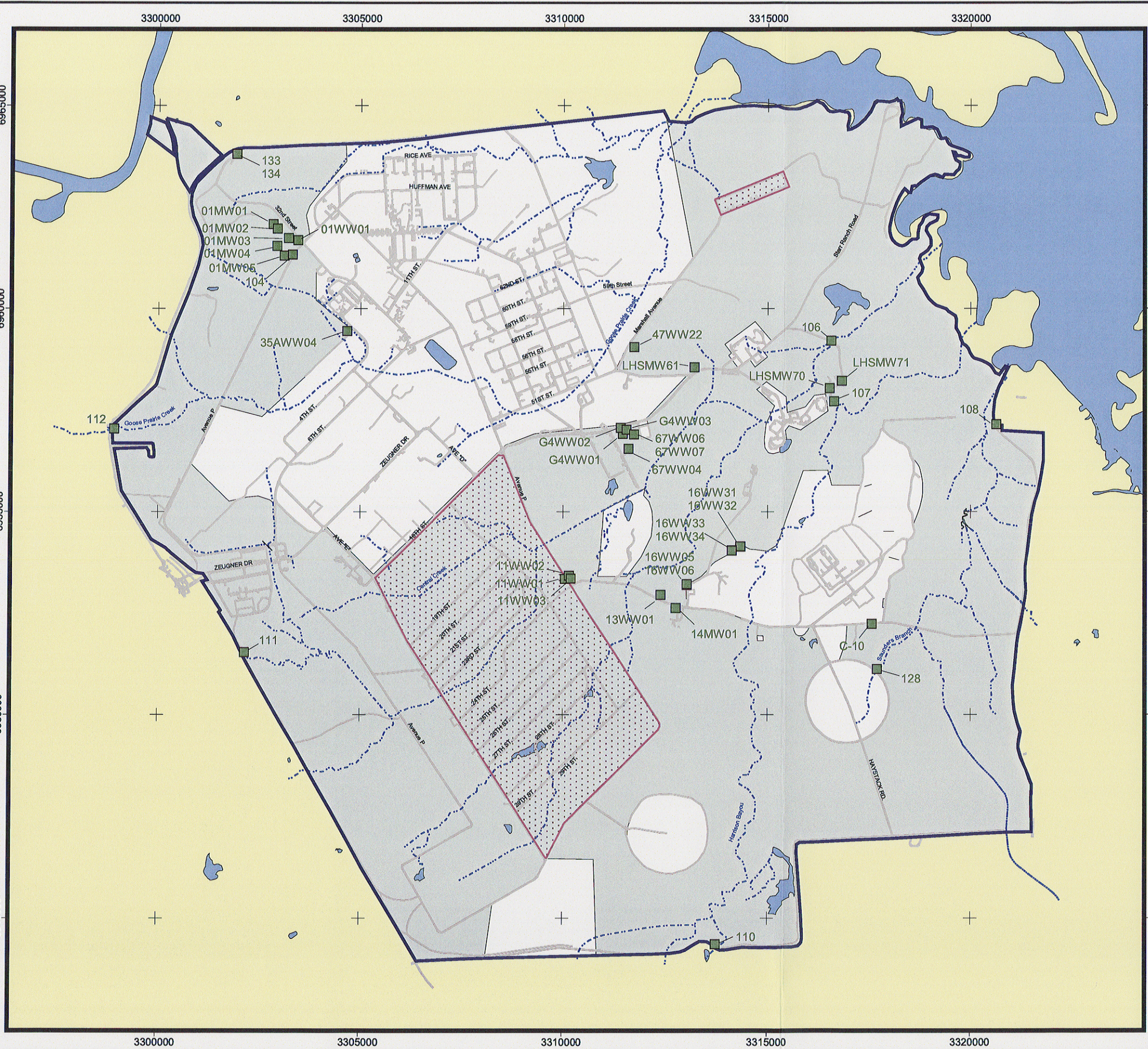
COMPILED BY: P. Pace 03/15/04

CHECKED BY: A. Mayila 03/01/04

APPROVED BY: P. Srivastava 03/01/04

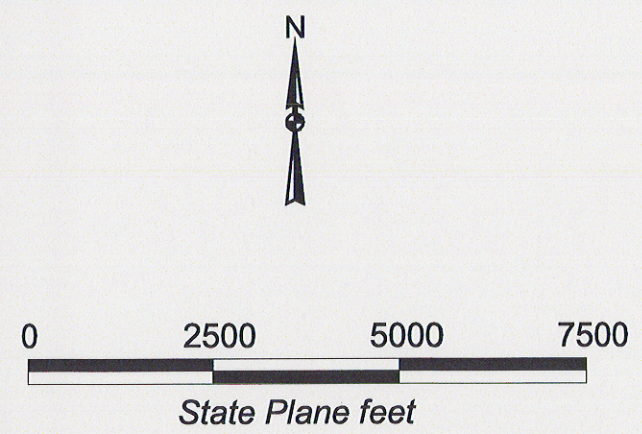
PLOT DATE: 04/26

REVISION FORMAT: 03/01/04



### Legend

- Monitoring Well
- Creek/Bayou
- Road
- Approximate Boundary of Longhorn Army Ammunition Plant
- Area Excluded from Initial Transfer
- Area to be Transferred
- Water Body
- Areas Excluded from Proposed Transfer
- Off Site



U.S. Army Corps of Engineers  
Tulsa District  
Tulsa, Oklahoma

Figure 4

Groundwater Monitoring Wells  
Environmental Condition of Property I

Longhorn Army Ammunition Plant  
Karnack, Texas



FILE LOCATION: seiknxis00\longhorn\gisworkspace\aprs\transfer1.apr

OFFICE: Houston, TX

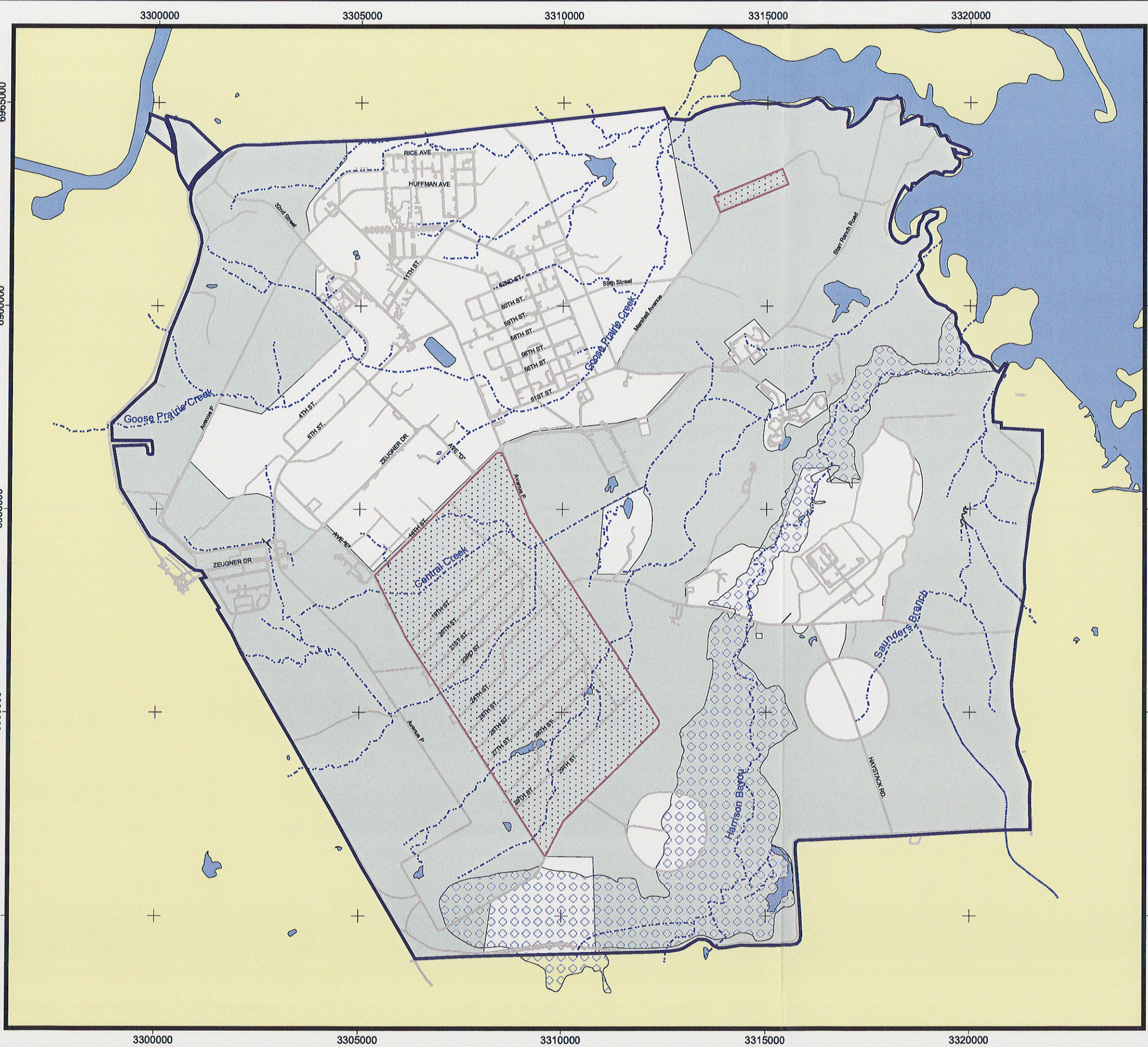
COMPILED BY: P. Pace 03/15/04

CHECKED BY: A. Mayila 03/01/04

APP'D BY: P. Srivastav 03/01/04

PLOT DATE: 04/26/0

REVISION FORMAT: 03/01/04



Legend

Creek/Bayou

Road

Approximate Boundary of Longhorn Army Ammunition Plant

Area Excluded from Initial Transfer

Area to be Transferred

Potential Wetland

Water Body

Off Site

N

0250050007500

State Plane feet

U.S. Army Corps of Engineers  
Tulsa District  
Tulsa, Oklahoma

Figure 5

Streams and Lakes  
Environmental Condition of Property I

Longhorn Army Ammunition Plant  
Karnack, Texas



***Attachment 1***  
***References***

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U.S. Army Corps of Engineers (USACE), Tulsa District, 1995, Final Remedial Investigation/Feasibility Study, Sites 13 and 14, Longhorn Army Ammunition Plant, (Volumes I-III), June.

USACE, 1995, Site Investigations, Preliminary Scope of Investigations Group 5 Sites, Longhorn Army Ammunition Plant, February.

USACE, 1995, Final DERPMIS/RMIS Resolution Document, Longhorn Army Ammunition Plant, June.

USACE, 1995, Proposed Plan of Action Sites 13 and 14 (Group 3), Longhorn Army Ammunition Plant Longhorn Army Ammunition Plant, Marshall, Texas, June.

USACE, 1996, Record of Decision for No Further Action at LHAAP Sites 13 and 14 at Longhorn Army Ammunition Plant, February.

USACE, 1998, Record of Decision for No Further Action at Group 1 Sites, Longhorn Army Ammunition Plant, January.

U.S. Fish and Wildlife Services, 2000, Final Environmental Assessment for the Proposed Establishment of the Caddo Lake National Wildlife Refuge through Management Agreement of Transfer of Longhorn Army Ammunition Plant from the Department of the Army to the Department of Interior, USFWS, Harrison County, Texas, September.

U.S. Fish and Wildlife Service, 2003, Contaminants Investigation of Northern Central and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas, November.



***Attachment 2***  
***Environmental Protection Provisions***

## **ATTACHMENT 2**

### ***Environmental Protection Provisions***

The following conditions, restrictions, and notifications will be incorporated by reference into the Letter of Transfer from the Department of the Army to the Department of Interior (DOI) to ensure the protection of human health and the environment and in furtherance of ongoing and completed remediation activities at Caddo Lake National Wildlife Refuge.

### ***Inclusion of Provisions:***

The federal agency to whom the property is transferred shall neither transfer the property, lease the property, nor grant any interest, privilege, or license whatsoever in connection with the property without the inclusion of the environmental protection provisions contained herein, and shall require the inclusion of such environmental protection provisions in all further deeds, transfers, leases, or grant of any interest, privilege, or license, unless there is a specific legal finding authorizing a change and specifically addressing any liabilities that will result from the change.

### ***Federal Facilities Agreement:***

The U.S. Army acknowledges that portions of Longhorn Army Ammunition Plant have been identified as National Priorities List (NPL) sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended. The USFWS acknowledges that the U.S. Army has provided it with a copy of the LHAAP Federal Facility Agreement (FFA) dated December 30, 1991 and will provide the USFWS with a copy of any amendments thereto. The USFWS, its successors and assigns, agrees that should any conflict arise between the terms of the FFA as they presently exist or may be amended, and the provisions of this property transfer, the terms of the FFA will take precedence. The USFWS, its successors and assigns, further agree that notwithstanding any other provisions of the transfer, the U.S. Army assumes no liability to the USFWS, its successors and assigns, should implementation of the FFA interfere with the use of the Property. The USFWS, its successors and assigns, shall have no claim on account of any such interference against the U.S. Army or any officer, agent, employee or contractor thereof.

### ***No Liability for Non-Army Contamination:***

The U.S. Army shall not incur liability for response action or corrective action found to be necessary after the date of transfer, in any case in which the federal agency to whom the property is transferred, or other non-Army person or entity is identified as the party responsible for contamination of the property.

### ***CERCLA Access Notice:***

The U.S. Army, U.S. Environmental Protection Agency (USEPA) and Texas Commission on Environmental Quality (TCEQ) and their officers, agents, employees, contractors, and subcontractors have the right, upon reasonable notice to the USFWS, to enter upon the Premises in any case in which a response action or corrective action is found to be necessary after the date of transfer of the property or such access is necessary to carry out a response action or corrective action on adjoining property, including, without limitation, the following purposes:

- a. To conduct investigations and surveys, including, where necessary, drilling, soil and water sampling, testing-pitting, test soil borings and other activities;
- b. To inspect field activities of the U.S. Army and its contractors and subcontractors;
- c. To conduct any test or survey related to the environmental conditions at the transferred Property or to verify any data submitted to the USEPA or TCEQ by the U.S. Army relating to such conditions;
- d. To construct, operate, maintain or undertake any other response or remedial actions as required or necessary including, but not limited to monitoring wells, pumping wells and treatment facilities.

### ***Notice of the Presence of Asbestos-Containing Materials and Covenant:***

- a. The USFWS is hereby informed and does acknowledge that friable and non-friable asbestos or asbestos-containing materials (ACM) has been found in buildings and structures on the Property identified in Table 7 and described in the Plant-wide Asbestos Survey Report (1995). The ACM in buildings and structures on the Property does not currently pose a threat to human health or the environment, and all friable asbestos that posed a risk to human health has either been removed or encapsulated.
- b. The USFWS covenants and agrees that its use and occupancy of the Property will be in compliance with all applicable laws relating to asbestos; and that the U.S. Army assumes no liability for future remediation of asbestos or damages for personal injury, illness, disability, or death, to the USFWS, its successors or assigns, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with asbestos on the Property, whether the USFWS, its successors or assigns, have properly warned or failed to properly warn the individual(s) injured. The USFWS agrees to be responsible for any future remediation of asbestos in buildings and structures found to be necessary on the Property.
- c. Unprotected or unregulated exposures to asbestos in product manufacturing, shipyard, and building construction workplaces have been associated with asbestos-related diseases. Both the Occupational Safety and Health Administration (OSHA) and the

USEPA regulate asbestos because of the potential hazards associated with exposure to airborne asbestos fibers. Both OSHA and USEPA have determined that such exposure increases the risk of asbestos-related diseases, which include certain cancers and which can result in disability or death.

- d. The USFWS acknowledges that it has inspected or has had the opportunity to inspect the Property as to its asbestos content and condition and any hazardous or environmental conditions relating thereto. The USFWS shall be deemed to have relied solely on its own judgment in assessing the overall condition of all or any portion of the Property, including, without limitation, any asbestos hazards or concerns.
- e. The U.S. Army assumes no liability for any damages to person or property, and gives no warranties, either expressed or implied, with regard to the presence or absence of asbestos or ACM in buildings and structures, or whether the property is or is not suitable for a particular purpose. The failure of the USFWS to inspect, or to be fully informed as to the condition of all or any portion of the buildings on the Property offered, will not constitute grounds for any claim or demand against the Army.
- f. The USFWS further agrees to indemnify and hold harmless the U.S. Army, its officers, agents and employees, from and against all suits, claims, demands or actions, liabilities, judgments, penalties, costs and attorneys' fees arising out of, or in any manner predicated upon, future asbestos abatement or remediation from within buildings and structures on the Property; disposal of ACM or asbestos after conveyance to the USFWS; personal injury, death or property damages resulting from, related to, caused by or arising out of exposure to asbestos within buildings or structures on the Property after the conveyance of such portion of the Property to the USFWS.

### ***Notice of the Potential for Presence of Polychlorinated Biphenyls and Covenant:***

- a. The USFWS is hereby informed and does acknowledge that equipment containing polychlorinated biphenyls (PCBs) may exist on the Property to be conveyed, and is described as fluorescent light ballasts ("Light Ballasts"). All Light Ballasts have been properly labeled in accordance with applicable laws and regulations in force at the time of purchase and installation to provide notification to future users, or has been removed and disposed of off post. Any PCB contamination or spills related to such Light Ballasts has been properly remediated prior to conveyance. The Light Ballasts does not currently pose a threat to human health or the environment.
- b. The USFWS covenants and agrees that its continued possession, use and management of any Light Ballasts will be in compliance with all applicable laws relating to PCBs and PCB containing equipment, and the U.S. Army assumes no liability for the future remediation of the Light Ballasts or damages for personal injury, illness, disability, or death to the USFWS, its successors or assigns, or to any other person, including members of the general public arising from or incident to future use, handling,

management, disposition, or other activity causing or leading to contact of any kind whatsoever with the Light Ballasts, whether the USFWS, its successors or assigns have properly warned or failed to properly warn the individual(s) injured. The USFWS agrees to be responsible for any future remediation of PCBs associated with Light Ballasts in the buildings on the Property transferred to the USFWS.

***Notice of the Presence of Lead-Based Paint and Covenant Against the Use of the Property for Residential Purposes:***

- a. The U.S. Army covenants that the Property was not used as "Residential Real Property". The USFWS covenants that the Property is not intended to be used as "Residential Real Property" or occupied by children under 6 years of age. "Residential Real Property" means any dwelling units, common areas, building exterior surfaces, and any surrounding land, including outbuilding, fences and play equipment affixed to the land, available for use by the residents but not including land used for agricultural, commercial, industrial, or other non-residential purpose, and not including paint on the pavement of parking lots, garages, or roadways and buildings visited regularly by the same child, 6 years of age under, on at least two different days, within any week, including day-care centers, preschools and kindergarten classrooms.
- b. The USFWS is hereby informed and does acknowledge that all buildings on the Property, except facility TS-12, were constructed or rehabilitated prior to 1978, and are therefore, presumed to contain lead-based paint (LBP). Lead from paint, paint chips, and dust can pose health hazards if not managed properly. The USFWS is notified that the Property may present exposure to lead from LBP that may place young children at risk of developing lead poisoning. Lead poisoning in young children may produce permanent neurological damage, including learning disabilities, reduced intelligence quotient, behavioral problems, and impaired memory. Lead poisoning also poses a particular risk to pregnant women. Under federal law, the seller of any interest in residential real property is required to provide the buyer with any information on LBP hazards from risk assessments or inspections in the seller's possession and notify the buyer of any known LBP hazards.
- c. Available information concerning known LBP and/or LBP hazards, the location of LBP and/or LBP hazards, and the condition of painted surfaces is contained in the Environmental Baseline Survey (EBS) dated October 1998. The USFWS hereby acknowledges receipt of the EBS. In addition, the USFWS acknowledges that it has received the opportunity to conduct its own risk assessment or inspection for the presence of LBP and/or LBP hazards prior to execution of this document. Available information concerning known LBP and/or LBP hazards prior to execution of this document.
- d. The Grantee covenants and agrees that it shall not permit the occupancy or use of any buildings or structures on the Property as Residential Real Property, as defined in paragraph A, above, without complying with this section and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based



paint hazards. Prior to permitting the occupancy of the Property where its use subsequent to sale is intended for residential habitation, the Grantee specifically agrees to perform, at its sole expense, the Army's abatement requirements under Title X of the Housing and Community Development Act of 1992 (Residential Lead-Based Paint Hazard Reduction Act of 1992) (hereinafter Title X).

The Grantee shall, after consideration of the guidelines and regulations established pursuant to Title X: (1) Perform a reevaluation of the Risk Assessment if more than 12 months have elapsed since the date of the last Risk Assessment; (2) Comply with the joint HUD and EPA Disclosure Rule (24 CFR 35, Subpart H, 40 CFR 745, Subpart F), when applicable, by disclosing to prospective purchasers the known presence of lead-based paint and/or lead-based paint hazards as determined by previous risk assessments; (3) Abate lead dust and lead-based paint hazards in pre-1960 residential real property, as defined in paragraph A, above, in accordance with the procedures in 24 CFR 35; (4) Abate soil-lead hazards in pre-1978 residential real property, as defined in paragraph A, above, in accordance with the procedures in 24 CFR 35; (5) Abate lead-soil hazards following demolition and redevelopment of structures in areas that will be developed as residential real property; (6) Comply with the EPA lead-based paint work standards when conducting lead-based paint activities (40 CFR 745, Subpart L); (7) Perform the activities described in this paragraph within 12 months of the date of the lead-based paint risk assessment and prior to occupancy or use of the residential real property; and (8) Send a copy of the clearance documentation to the Grantor.

In complying with these requirements, the Grantee covenants and agrees to be responsible for any abatement or remediation of lead-based paint or lead-based paint hazards on the buildings or adjacent soil covered in this document, found to be necessary as a result of the subsequent use of the Property for residential purposes. The Grantee covenants and agrees to comply with solid or hazardous waste laws that may apply to any waste that may be generated during the course of lead-based paint abatement activities.

- e. The USFWS further agrees to indemnify and hold harmless the U.S. Army, its officers, agents and employees, from and against all suits, claims, demands, or actions, liabilities, judgments, costs and attorney's fees arising out of, or in a manner predicated upon personal injury, death or property damage resulting from, related to, caused by or arising out of LBP or LBP hazards on the Property if used for Residential Real Property.
- f. The covenants, restrictions, and requirements of this Section shall be binding upon the Grantee, its successors and assigns and all future owners and shall be deemed to run with the land. The Grantee on behalf of itself, its successors and assigns covenants that it will include and make legally binding, this Section, in all subsequent transfers, leases, or conveyance documents.

### ***Notice of the Presence of Radon and Covenant:***

Available and relevant radon assessment data pertaining to the Property is located in the EBS, dated October 1998. According to said radon assessment data, those structures shown as 703-D, 702 707-E, 705, 719, 720-A, 33-W, 41-W, 13-Y, 813 and 814 were tested and radon was not detected above the USEPA residential action level of 4 picoCuries per liter. Since the date of that study, demolition has been completed on 720-A, 705, 707E, 719, 33-W, 41-W, 13-Y, 813, and 814. No data is available for all other Buildings and/or they were classified as commercial or industrial type use buildings that were not required to be tested for radon. The USFWS shall comply with applicable law regarding the testing for and abatement of radon at the above-referenced Buildings that have not been tested for radon, at no cost to the U.S. Army prior to using these buildings for residential purposes. The USFWS, its successors and assigns, covenant that they will include this radon notice in all subsequent conveyance documents that include said untested Buildings, or any portion thereof.

### ***Notice of the Potential for the Presence of Munitions and Explosives Concern, and Covenant:***

Based upon a review of existing records and available information, none of the buildings or land proposed for transfer is known or suspected to contain munitions and explosive of concern (MEC). In the event that USFWS, its successors, or assign should discover any MEC, on the property, it shall not attempt to remove or destroy it. The Harrison County Sheriff's Department will be the point of contact. An alternate contact is the City of Marshall Fire Department. They will then promptly contact the U.S. Army's 705th Explosives Ordnance Detachment (EOD) at Fort Polk, LA.

MEC may be present on adjacent property. The U.S. Army plans to perform MEC investigation on the adjacent property (LHAAP-27, -53 and -54) and retains the right to use exclusion zones. The investigation activities may have an impact on the Property through use of exclusion zones that intersect the Property. Due to the use of exclusion zones, temporary notices and restrictions may be issued to protect public safety, human health, and the environment. These temporary restrictions and notices may include but are not limited to, the removal of MEC on the adjacent property, temporary evacuation, limited closure of facilities, and environmental cleanup. In the unlikely event that evacuation is required, all action will be carried out as expeditiously as possible to minimize inconveniences to the USFWS, its successor, or assigns. Upon the completion of all MEC work within the exclusion zones, all temporary notices and restrictions shall be removed.

### ***Notice of Groundwater Monitoring Wells Covenant:***

- a. The USFWS is hereby informed and does acknowledge the presence on the Property of groundwater monitoring wells that are necessary for the U.S. Army to complete remedial action or monitoring after the date of transfer of title to the Property, or portions thereof.
- b. Promptly upon the determination by the U.S. Army that a well is no longer necessary for remedial action or monitoring, the Army will close such well at the Army's sole cost and expense in accordance with applicable laws, regulations, and ordinances.

### ***Notice of Archaeological Property and Preservation Covenant:***

- a. In consideration of the conveyance of the real property that includes twenty seven (27) archaeological properties, 41HS240, 41HS241, 41HS385, 41HS404, 41HS406, 41HS407, 41HS408, 41HS409, 41HS436, 41HS484, 41HS485, 41HS539, 41HS754, 41HS755, 41HS808, 41HS809, 41HS810, 41HS811, 41HS812, 41HS813, 41HS815, 41HS816, 41HS817, 41HS818, 41HS819, 41HS820, and 41HS821, and twenty four (24) archivally identified sites located in the County of Harrison, Texas, the USFWS hereby covenants on behalf of itself, its heirs, successors, and assigns at all times to the Texas State Historic Preservation Officer, to maintain and preserve the archaeological properties. The USFWS will honor its responsibilities under the National Historic Preservation Act and will coordinate all activities in furtherance of its responsibilities with the Texas State Historic Preservation Office, appropriate federally recognized tribes and other interested parties.

### ***Conditions, Restrictions, and Covenants Binding and Enforceable:***

These restrictions and covenants are binding on the USFWS, its successors and assigns and shall be included in subsequent deeds; and shall run with the land; are forever enforceable; shall benefit the public in general and the territory surrounding the Property, including lands retained by the U.S. Army; and shall further the common environmental objectives of the U.S. Army and the State of Texas; and are therefore enforceable by the U.S. Army and the State of Texas.

***Attachment 3***

***Underground Storage Tank Removal Correspondences***

*Thiokol* CORPORATION

## ORDNANCE OPERATIONS

February 8, 1994

TO: D. Burroughs

CC: S. Flowers, J. Hinton, L. Johnson, I. Nathan (ACO),  
L. Spunaugle, EQ 5.37

FROM: Ken Michels

SUBJECT: Final Review of UST Activity Report

See subject letter attached from Mike Brashear of the Texas Natural Resource Conservation Commission (TNRCC) regarding the UST activities at LHAAP in June, 1993. The tanks involved in this remedial action were the 280 gallon tank at 12-G and the 10,000 gallon tank at 703 C-1. The registration was amended in November, 1993 and now shows there are no UST's located on this facility.

Please contact me at 2774 if you have any questions regarding this matter.



Ken Michels  
Environmental Engineer

Attachment a/s



John Hall, Chairman  
Pam Reed, Commissioner  
Peggy Garner, Commissioner  
Anthony Grigsby, Executive Director



## TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

*Protecting Texas by Reducing and Preventing Pollution*

February 2, 1994

Mr. Chris Roddam  
Longhorn Army Ammunition Plant  
P.O. Box 1029  
Marshall, Texas 75761-1029

Re: Final Review of UST Activity Report  
Longhorn Army Ammunition Plant, Hwy. 134 and Spur 449, Karnack,  
Harrison Co.  
UST No. 5555

Dear Mr. Roddam:

This office has completed its review of the data and information provided regarding the UST activities on June 16, 1993 at the above-referenced site. Based on the information available, it appears that the actions taken have been satisfactory and no further remedial action is required at this time. The registration should be amended to reflect that the tank has been removed. A registration form is enclosed. Please send the original form to the address shown on the registration form.

We appreciate your cooperation in this matter. If you have any questions regarding these matters, please contact Jean L. Ferry of the Texas Natural Resource Conservation Commission Region 5 Office at 903/595-5466.

Sincerely,

A handwritten signature in cursive script that reads "Mike Brashear".

Mike Brashear  
Region 5 Waste Manager

jlf  
Enclosure

# TEXAS WATER COMMISSION - UNDERGROUND STORAGE TANK REGISTRATION FORM

|            |                                |                                                                                                                               |                               |
|------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| FOR<br>USE | Please Mail Completed Form To: | UST Registration Section, PST Division<br>Texas Water Commission<br>P.O. Box 13087 - Capitol Station<br>Austin, TX 78711-3087 | Facility ID Number (If known) |
|            |                                |                                                                                                                               | 0005555                       |
|            |                                |                                                                                                                               | Owner ID Number (If known)    |
|            |                                |                                                                                                                               | 03452                         |

## I. OWNER INFORMATION

|                                              |                             |                   |
|----------------------------------------------|-----------------------------|-------------------|
| Owner Name<br>Longhorn Army Ammunition Plant |                             |                   |
| Mailing Address<br>P.O. Box 1029             |                             |                   |
| City<br>Marshall                             | State<br>TX                 | Zip Code<br>75671 |
| County<br>Harrison                           |                             |                   |
| Contact Person<br>Ira Nathan                 | Telephone<br>(903) 679-2613 |                   |

## II. FACILITY INFORMATION

|                                                 |                             |                   |
|-------------------------------------------------|-----------------------------|-------------------|
| Facility Name<br>Longhorn Army Ammunition Plant |                             |                   |
| Physical Address<br>Hwy 134 & Spur 449          |                             |                   |
| City<br>Karnack                                 | State<br>TX                 | Zip Code<br>75661 |
| County<br>Harrison                              |                             |                   |
| Contact Person<br>David Burroughs               | Telephone<br>(903) 679-2668 |                   |

|                                                              |                                                        |
|--------------------------------------------------------------|--------------------------------------------------------|
| TYPE OF OWNER                                                |                                                        |
| Private or Corporate <input type="checkbox"/>                | State Government <input type="checkbox"/>              |
| Local Government <input type="checkbox"/>                    | Federal Government <input checked="" type="checkbox"/> |
| Location of Records<br>(If off-site)<br>Address, City, State |                                                        |
| Custodian of Records                                         | Telephone<br>( )                                       |

|                                                                                  |                                              |
|----------------------------------------------------------------------------------|----------------------------------------------|
| TYPE OF FACILITY (mark all that apply)                                           |                                              |
| Retail <input type="checkbox"/>                                                  | Wholesale <input type="checkbox"/>           |
| Fleet Refueling <input type="checkbox"/>                                         | Farm or Residential <input type="checkbox"/> |
| Industrial, Chemical, or Manufacturing Plant <input checked="" type="checkbox"/> | Aircraft Refueling <input type="checkbox"/>  |
| Other (please specify)                                                           | Indian Land <input type="checkbox"/>         |
| Number of Underground Tanks at This Facility<br>1                                | Number of Aboveground Tanks at This Facility |

## III. REGISTRATION STATUS

|                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| If this is the first time that this facility has been registered, or if you are not sure if it has been registered, mark here:<br>ORIGINAL FORM <input type="checkbox"/>                                                                                                                                                              | If this is an amendment (e.g. ownership change, location name change or UST status change) to a form that was previously filed with the TWC, mark here:<br>AMENDED FORM <input checked="" type="checkbox"/> |
| If this is an amendment to a UST form that has already been filed with the Texas Water Commission, briefly explain the change in the space provided (attach additional sheets if necessary). Please include dates, names, addresses, phone numbers and any other pertinent information.<br>UST's permanently removed from the ground. |                                                                                                                                                                                                             |

## IV. FINANCIAL RESPONSIBILITY

|                                                          |                                                  |                                                            |                                                   |
|----------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------|---------------------------------------------------|
| COMPLIANCE DATE (mark one)                               |                                                  |                                                            |                                                   |
| Sept. 29, 1989 <input type="checkbox"/>                  | Oct. 26, 1989 <input type="checkbox"/>           | April 26, 1990 <input type="checkbox"/>                    | Oct. 26, 1990 <input checked="" type="checkbox"/> |
| FINANCIAL RESPONSIBILITY MECHANISM (mark all that apply) |                                                  |                                                            |                                                   |
| Letter of Credit <input type="checkbox"/>                | Trust Fund <input type="checkbox"/>              | Insurance or Risk Retention Group <input type="checkbox"/> | Surety Bond <input type="checkbox"/>              |
| Guarantee <input type="checkbox"/>                       | Self Insured <input checked="" type="checkbox"/> | PST Remediation Fund <input type="checkbox"/>              | Standby Trust Fund <input type="checkbox"/>       |
| Other (please specify)                                   |                                                  |                                                            |                                                   |

## V. INSTALLER CERTIFICATION

NOTE: This section must be completed and signed by the installer. Leave blank if no installation activity is involved.

I certify that the information provided concerning recent installations is true to the best of my belief and knowledge:

Was tank testing completed during and after installation? ☐ Yes ☐ No

Installation Company Name (print) \_\_\_\_\_ Contractor's Registration Number \_\_\_\_\_

Installer's Name (print) \_\_\_\_\_ Installer's License Number \_\_\_\_\_

Installer Signature \_\_\_\_\_ Date Signed \_\_\_\_\_

## VI. OWNER CERTIFICATION

Under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and based on my knowledge of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

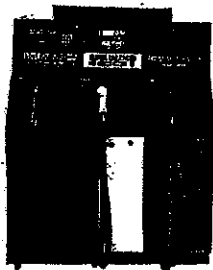
Owner or Owner's Authorized Representative (print) Ira Nathan Title (print) Chief Engineer, U. S. Army

Signature \_\_\_\_\_ Date Signed 9/1/93

# VII. DESCRIPTION OF UNDERGROUND STORAGE TANKS (UST's)

| Tank ID (e.g. 1, 2, 3 or A, B, C)                                                  |                                                                    |                                                                    |                                                         |                                                         |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| <b>TANK STATUS</b>                                                                 |                                                                    |                                                                    |                                                         |                                                         |
| Tank Installation Date (month/year)                                                | 4 / 1976                                                           | 6 / 1978                                                           | /                                                       | /                                                       |
| Tank Capacity (gallons)                                                            | 280                                                                | 10,000                                                             |                                                         |                                                         |
| 1. Currently in Use                                                                | 1. <input type="checkbox"/>                                        | 1. <input type="checkbox"/>                                        | 1. <input type="checkbox"/>                             | 1. <input type="checkbox"/>                             |
| 2. Temporarily Out of Service (date)                                               | 2. / /                                                             | 2. / /                                                             | 2. / /                                                  | 2. / /                                                  |
| Emptied (Yes/No)                                                                   | <input type="checkbox"/> Y <input type="checkbox"/> N              | <input type="checkbox"/> Y <input type="checkbox"/> N              | <input type="checkbox"/> Y <input type="checkbox"/> N   | <input type="checkbox"/> Y <input type="checkbox"/> N   |
| 3. Permanently Abandoned In-place (date)                                           | 3. / /                                                             | 3. / /                                                             | 3. / /                                                  | 3. / /                                                  |
| (must be filled with sand or concrete, etc.)                                       |                                                                    |                                                                    |                                                         |                                                         |
| 4. Permanently Removed from the Ground (date)                                      | 4. 6 / 16 / 93                                                     | 4. 6 / 16 / 93                                                     | 4. / /                                                  | 4. / /                                                  |
| <b>UST CONSTRUCTION AND CONTAINMENT</b>                                            | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                      | <b>Tank Piping</b>                                      |
| 1. Single Wall (mark all that apply) <input checked="" type="checkbox"/>           | 1. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 1. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 1. <input type="checkbox"/> <input type="checkbox"/>    | 1. <input type="checkbox"/> <input type="checkbox"/>    |
| 2. Double Wall                                                                     | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>    | 2. <input type="checkbox"/> <input type="checkbox"/>    |
| 3. External Jacket System                                                          | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>    | 3. <input type="checkbox"/> <input type="checkbox"/>    |
| 4. Excavation/Trench Liner System                                                  | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>    | 4. <input type="checkbox"/> <input type="checkbox"/>    |
| 5. Piping System:                                                                  | 5.                                                                 | 5.                                                                 | 5.                                                      | 5.                                                      |
| a. Pressurized                                                                     | a. <input type="checkbox"/>                                        | a. <input type="checkbox"/>                                        | a. <input type="checkbox"/>                             | a. <input type="checkbox"/>                             |
| b. Suction                                                                         | b. <input type="checkbox"/>                                        | b. <input type="checkbox"/>                                        | b. <input type="checkbox"/>                             | b. <input type="checkbox"/>                             |
| c. Gravity                                                                         | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                             | c. <input type="checkbox"/>                             |
| 6. Other (please specify)                                                          | 6. _____                                                           | 6. _____                                                           | 6. _____                                                | 6. _____                                                |
| <b>MATERIAL OF CONSTRUCTION</b>                                                    | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                      | <b>Tank Piping</b>                                      |
| 1. Steel                                                                           | 1. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 1. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 1. <input type="checkbox"/> <input type="checkbox"/>    | 1. <input type="checkbox"/> <input type="checkbox"/>    |
| 2. Fiberglass-Reinforced Plastic (FRP)                                             | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>    | 2. <input type="checkbox"/> <input type="checkbox"/>    |
| 3. Composite (steel w/FRP laminate)                                                | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>    | 3. <input type="checkbox"/> <input type="checkbox"/>    |
| 4. Concrete                                                                        | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>    | 4. <input type="checkbox"/> <input type="checkbox"/>    |
| 5. Other (please specify)                                                          | 5. _____                                                           | 5. _____                                                           | 5. _____                                                | 5. _____                                                |
| <b>RELEASE DETECTION (mark all that apply) <input checked="" type="checkbox"/></b> | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                      | <b>Tank Piping</b>                                      |
| 1. Vapor Monitoring                                                                | 1. <input type="checkbox"/> <input type="checkbox"/>               | 1. <input type="checkbox"/> <input type="checkbox"/>               | 1. <input type="checkbox"/> <input type="checkbox"/>    | 1. <input type="checkbox"/> <input type="checkbox"/>    |
| 2. Groundwater Monitoring                                                          | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>               | 2. <input type="checkbox"/> <input type="checkbox"/>    | 2. <input type="checkbox"/> <input type="checkbox"/>    |
| 3. Monitoring Above Excavation Liner                                               | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>    | 3. <input type="checkbox"/> <input type="checkbox"/>    |
| 4. Automatic In-Tank Monitoring & Inventory Control                                | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>    | 4. <input type="checkbox"/> <input type="checkbox"/>    |
| Interstitial Monitoring for Double Wall UST's                                      | 5. <input type="checkbox"/> <input type="checkbox"/>               | 5. <input type="checkbox"/> <input type="checkbox"/>               | 5. <input type="checkbox"/> <input type="checkbox"/>    | 5. <input type="checkbox"/> <input type="checkbox"/>    |
| Tightness Testing                                                                  | 6. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 6. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 6. <input type="checkbox"/> <input type="checkbox"/>    | 6. <input type="checkbox"/> <input type="checkbox"/>    |
| 7. Inventory Control                                                               | 7. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 7. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 7. <input type="checkbox"/> <input type="checkbox"/>    | 7. <input type="checkbox"/> <input type="checkbox"/>    |
| 8. Unknown/None                                                                    | 8. <input type="checkbox"/> <input type="checkbox"/>               | 8. <input type="checkbox"/> <input type="checkbox"/>               | 8. <input type="checkbox"/> <input type="checkbox"/>    | 8. <input type="checkbox"/> <input type="checkbox"/>    |
| 9. Line Leak Detectors                                                             | 9. <input type="checkbox"/> <input type="checkbox"/>               | 9. <input type="checkbox"/> <input type="checkbox"/>               | 9. <input type="checkbox"/> <input type="checkbox"/>    | 9. <input type="checkbox"/> <input type="checkbox"/>    |
| 10. Other (please specify)                                                         | 10. _____                                                          | 10. _____                                                          | 10. _____                                               | 10. _____                                               |
| <b>SUBSTANCE STORED</b>                                                            |                                                                    |                                                                    |                                                         |                                                         |
| 1. Empty                                                                           | 1. <input type="checkbox"/> 4. <input type="checkbox"/>            | 1. <input type="checkbox"/> 4. <input type="checkbox"/>            | 1. <input type="checkbox"/> 4. <input type="checkbox"/> | 1. <input type="checkbox"/> 4. <input type="checkbox"/> |
| 2. Gasoline                                                                        | 2. <input type="checkbox"/> 5. <input type="checkbox"/>            | 2. <input type="checkbox"/> 5. <input type="checkbox"/>            | 2. <input type="checkbox"/> 5. <input type="checkbox"/> | 2. <input type="checkbox"/> 5. <input type="checkbox"/> |
| 3. Diesel                                                                          | 3. <input checked="" type="checkbox"/> 6. <input type="checkbox"/> | 3. <input checked="" type="checkbox"/> 6. <input type="checkbox"/> | 3. <input type="checkbox"/> 6. <input type="checkbox"/> | 3. <input type="checkbox"/> 6. <input type="checkbox"/> |
| 7. Other Petroleum Product (please specify)                                        | 7. _____                                                           | 7. _____                                                           | 7. _____                                                | 7. _____                                                |
| 8. Hazardous Substance                                                             | 8. _____                                                           | 8. _____                                                           | 8. _____                                                | 8. _____                                                |
| a. Name of Principal CERCLA Substance                                              | a. _____                                                           | a. _____                                                           | a. _____                                                | a. _____                                                |
| b. Chemical Abstract Service (CAS) No.                                             | b. _____                                                           | b. _____                                                           | b. _____                                                | b. _____                                                |
| c. Mixture of Hazardous Substances                                                 | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                             | c. <input type="checkbox"/>                             |
| 9. Mixture of Petroleum & Hazardous Substance                                      | 9. <input type="checkbox"/>                                        | 9. <input type="checkbox"/>                                        | 9. <input type="checkbox"/>                             | 9. <input type="checkbox"/>                             |
| 10. Other (please specify)                                                         | 10. _____                                                          | 10. _____                                                          | 10. _____                                               | 10. _____                                               |
| <b>SPILL AND OVERFILL PREVENTION</b>                                               |                                                                    |                                                                    |                                                         |                                                         |
| 1. Tight-Fill Fitting (mark all that apply) <input checked="" type="checkbox"/>    | 1. <input type="checkbox"/>                                        | 1. <input type="checkbox"/>                                        | 1. <input type="checkbox"/>                             | 1. <input type="checkbox"/>                             |
| 2. Spill Container/Liquid-Tight Sump                                               | 2. <input type="checkbox"/>                                        | 2. <input type="checkbox"/>                                        | 2. <input type="checkbox"/>                             | 2. <input type="checkbox"/>                             |
| 3. Automatic Overfill Device:                                                      | 3.                                                                 | 3.                                                                 | 3.                                                      | 3.                                                      |
| a. Shut-Off Valve                                                                  | a. <input type="checkbox"/>                                        | a. <input type="checkbox"/>                                        | a. <input type="checkbox"/>                             | a. <input type="checkbox"/>                             |
| b. Flow Restrictor Valve                                                           | b. <input type="checkbox"/>                                        | b. <input type="checkbox"/>                                        | b. <input type="checkbox"/>                             | b. <input type="checkbox"/>                             |
| c. High Level Alarm                                                                | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                                        | c. <input type="checkbox"/>                             | c. <input type="checkbox"/>                             |
| 4. Unknown/None                                                                    | 4. <input checked="" type="checkbox"/>                             | 4. <input checked="" type="checkbox"/>                             | 4. <input type="checkbox"/>                             | 4. <input type="checkbox"/>                             |
| <b>CORROSION PROTECTION</b>                                                        | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                                 | <b>Tank Piping</b>                                      | <b>Tank Piping</b>                                      |
| 1. External Coatings: (mark all that apply) <input checked="" type="checkbox"/>    | 1.                                                                 | 1.                                                                 | 1.                                                      | 1.                                                      |
| a. Painted (e.g. asphaltic)                                                        | a. <input type="checkbox"/> <input type="checkbox"/>               | a. <input type="checkbox"/> <input type="checkbox"/>               | a. <input type="checkbox"/> <input type="checkbox"/>    | a. <input type="checkbox"/> <input type="checkbox"/>    |
| b. Dielectric (e.g. coal tar epoxy)                                                | b. <input type="checkbox"/> <input type="checkbox"/>               | b. <input type="checkbox"/> <input type="checkbox"/>               | b. <input type="checkbox"/> <input type="checkbox"/>    | b. <input type="checkbox"/> <input type="checkbox"/>    |
| c. Fiberglass-Reinforced Plastic                                                   | c. <input type="checkbox"/> <input type="checkbox"/>               | c. <input type="checkbox"/> <input type="checkbox"/>               | c. <input type="checkbox"/> <input type="checkbox"/>    | c. <input type="checkbox"/> <input type="checkbox"/>    |
| d. Taped/Wrapped Piping                                                            | d. <input type="checkbox"/>                                        | d. <input type="checkbox"/>                                        | d. <input type="checkbox"/>                             | d. <input type="checkbox"/>                             |
| Internally Lined Tank (e.g. epoxy resin)                                           | 2. <input type="checkbox"/>                                        | 2. <input type="checkbox"/>                                        | 2. <input type="checkbox"/>                             | 2. <input type="checkbox"/>                             |
| 3. Cathodic Protection System                                                      | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>               | 3. <input type="checkbox"/> <input type="checkbox"/>    | 3. <input type="checkbox"/> <input type="checkbox"/>    |
| 4. Composite Tank (steel w/FRP laminate)                                           | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>               | 4. <input type="checkbox"/> <input type="checkbox"/>    | 4. <input type="checkbox"/> <input type="checkbox"/>    |
| 5. Noncorrodible Material Construction                                             | 5. <input type="checkbox"/> <input type="checkbox"/>               | 5. <input type="checkbox"/> <input type="checkbox"/>               | 5. <input type="checkbox"/> <input type="checkbox"/>    | 5. <input type="checkbox"/> <input type="checkbox"/>    |
| 6. Electrical Isolation                                                            | 6. <input type="checkbox"/> <input type="checkbox"/>               | 6. <input type="checkbox"/> <input type="checkbox"/>               | 6. <input type="checkbox"/> <input type="checkbox"/>    | 6. <input type="checkbox"/> <input type="checkbox"/>    |
| 7. Unknown/None                                                                    | 7. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 7. <input checked="" type="checkbox"/> <input type="checkbox"/>    | 7. <input type="checkbox"/> <input type="checkbox"/>    | 7. <input type="checkbox"/> <input type="checkbox"/>    |

032364



# PUMP MASTERS, Inc.

405 Creswell St., Shreveport, LA 71101

Phone 318-425-1557

Outside LA 1-800-722-8711

LA Wats 1-800-222-3174

Fax 318-424-7818

*file*



August 24, 1993

Longhorn Army Ammunition Plant  
Mr. Lonnie Spunaugle  
P.O. Box 1029  
Marshall, Texas 75670

Dear Mr. Spunaugle,

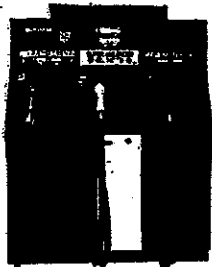
Enclosed is your copy of the report sent to the Texas Water Commission on August 23, 1993 regarding the letter sent to Mr. Chris Rodham on July 30, 1993. Copies of this report have been sent to TWC in Austin and the district office in Tyler.

Please call if you have questions.

Sincerely,

*Vicki D. Dennis*

Vicki D. Dennis



# PUMP MASTERS, INC.

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Phone 318-425-1557

Outside LA 1-800-722-8711

LA Wats 1-800-222-3174

Fax 318-424-7818



August 23, 1993

Texas Water Commission  
Underground Storage Tank Division  
8900 Shoal Creek  
Building 200  
Austin, Texas 78759

RE: Subsurface Contamination at Longhorn Army Ammunition  
Plant, Hwy 134 and Spur 449, Karnack, Harrison, Co.,  
Texas. Facility I.D. No. 5555

Gentlemen:

I am in receipt of your letter dated July 30, 1993 regarding  
our report submitted July 6, 1993. I have addressed each  
delinquent item as follows:

- 1.) Analytical samples were pulled in accordance with  
instructions from TWC inspector Jean Ferry, District  
5. Pump Masters returned to location on August 5,  
1993, hand augured to 8.5' at Section 703 C-1 and  
4' at Section 12-G, and pulled soil samples of back-  
fill material. Analytical results are enclosed.
- 2.) A manifest for tank destruction is enclosed.
- 3.) The manifest for waste removal is enclosed.
- 4.) A detailed site diagram of each tankpit which  
indicates sampling locations has been enclosed.

I hope this answers your questions regarding this location.  
Please call if you need further assistance.

Sincerely,

Mack E. Jones  
TWC License ILP000274



**ArkLaTex Analytical Services, Inc.**

P.O. Box 17867 Shreveport, LA 71138-0867 (318) 687-3771

RECEIVED AUG 12 1993

Customer ID: 439

Lab ID: 3159

Pump Masters  
405 Creswell Street  
Shreveport, LA 71101

Date Received: 08/05/93

Report Date: 08/11/93

Purchase Order No.: 5018

Location: Longhorn Army Ammunition Plant - Karnack, TX

Matrix: Soil

Collected by: Danny Durbin

**TOTAL PETROLEUM HYDROCARBONS**  
**TPH-Diesel**

| REPORT | SAMPLE | DATE/TIME<br>COLLECTED | RESULTS | DATE/TIME<br>ANALYZED | TECH |
|--------|--------|------------------------|---------|-----------------------|------|
| 3159-1 | LH-6   | 08/05/93 1015          | 72.1    | 08/10/93 1109         | GG   |
| 3159-2 | LHSP-3 | 08/05/93 1040          | 125     | 08/10/93 1139         | GG   |

Note: Results are reported in mg/kg (ppm).

Method Reference: California Department of Health Services Method

Respectfully submitted,

Chris P. Warren  
Laboratory Supervisor

CHAIN-OF-CUSTODY RECORD

# ANALYSIS REQUEST

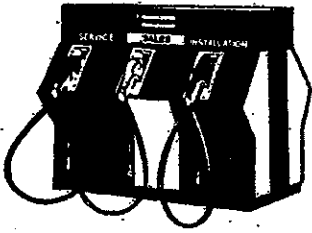
**PUMPMASTERS, INC.**

1533 Marshall St.  
SHREVEPORT, LA. 71101

Ph. 318-425-1557 or 1-800-259-8711  
Fax 318-424-7818

032367

[illegible]



# PUMP MASTERS, INC.

405 Creswell St., Shreveport, LA 71101  
 Phone 318-425-1557  
 Outside LA 1-800-722-8711  
 LA Wats 1-800-222-3174  
 Fax 318-424-7818



|                                                                         |              |                                |                        |
|-------------------------------------------------------------------------|--------------|--------------------------------|------------------------|
| 1. Owner Name (Corporation, Individual, Public Agency, or other Entity) |              | 12. Location of Tanks          |                        |
| Morton Thiokol Inc.-Longhorn Division                                   |              | Longhorn Army Ammunition Plant |                        |
| Street Address                                                          |              | Street Address or State Road   |                        |
| P.O. Box 1149                                                           |              | Hwy 134                        |                        |
| Parish                                                                  |              | Parish                         |                        |
| Harrison                                                                |              | Harrison                       |                        |
| City                                                                    | State        | City(Nearest)                  | State                  |
| Marshall, Texas                                                         | 75670        | Karnack, Texas                 |                        |
| Area Code                                                               | Phone Number | Contact Person                 | Area Code Phone Number |
|                                                                         |              | Lonnie Spunaugle               | 903-679-2713           |

|                                                                                             |                                             |
|---------------------------------------------------------------------------------------------|---------------------------------------------|
| 1. Tank(s) Removal Date <u>6 / 16 / 93</u>                                                  | 2. Tank(s) Disposal Date <u>6 / 17 / 93</u> |
| 3. Product stored in tank(s) <u>Diesel</u>                                                  |                                             |
| 4. Final Disposition <u>Cut 2' x 2' squares into ends of tanks and hauled off for scrap</u> |                                             |
| 5. Name of Disposal Site <u>River City Iron and Metal</u>                                   |                                             |
| 6. Location <u>Shreveport, La.</u>                                                          |                                             |

|                                                              |  |                                                               |  |
|--------------------------------------------------------------|--|---------------------------------------------------------------|--|
| 7. Soil Removal Date <u>    </u> / <u>    </u> / <u>    </u> |  | 8. Soil Disposal Date <u>    </u> / <u>    </u> / <u>    </u> |  |
| 9. Volume Removed <u>N/A</u>                                 |  |                                                               |  |
| 10. Name of Disposal Site <u>    </u>                        |  |                                                               |  |
| 11. Location <u>    </u>                                     |  |                                                               |  |

|                                                                |  |                                                                 |  |
|----------------------------------------------------------------|--|-----------------------------------------------------------------|--|
| 12. Water Removal Date <u>    </u> / <u>    </u> / <u>    </u> |  | 13. Water Disposal Date <u>    </u> / <u>    </u> / <u>    </u> |  |
| 14. Volume Removed <u>N/A</u>                                  |  |                                                                 |  |
| 15. Name of Disposal Site <u>    </u>                          |  |                                                                 |  |
| 16. Location <u>    </u>                                       |  |                                                                 |  |

I certify that I have personally examined and am familiar with the information submitted in this and all attached documents.

Mark E. Jones  
 Signature

August 23, 1993  
 Date Signed

032369

## PUMP MASTERS, INC. WASTE MANIFEST

No. 1007

## GENERAL INFORMATION

Business Name Longhorn Army Ammunition Plant  
 Address Hwy, 134 Telephone (903) 679-2713  
Karnack, TX.  
 General Description of Waste diesel fuel + water

Generator ID LAD 98643221 Waste Code 9  
 Total Quantity (Gallons) 20 gals Drums ☒ Bulk ☐ WCF#

I certify that the waste materials removed from the above premises contains no hazardous material.

Generator Representative (Print) Lonnie Ray Spunagle  
6-15-93 Lonnie Ray Spunagle  
 Date Serviced Generator Representative Signature

## TRANSPORTER INFORMATION

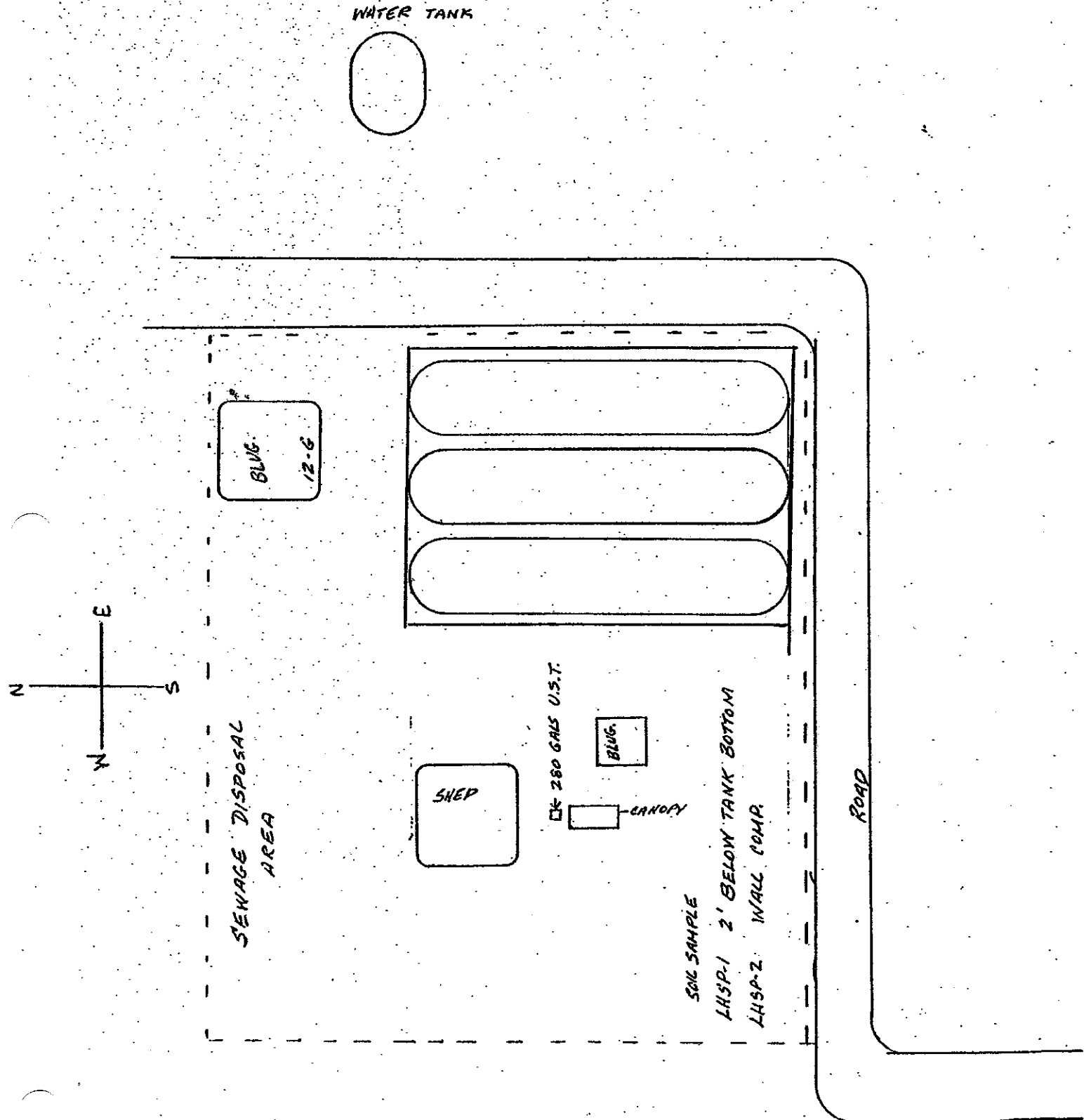
Name Pump Masters Inc Telephone 318-425-1557  
 EPA Transporter ID LAD 981909112 State ID LAD 98190911 Truck 422  
 Driver's Name (Print) Brett Barbo  
6-15-93 Brett Barbo  
 Date Driver's Signature

STORAGE  
RECYCLING FACILITY

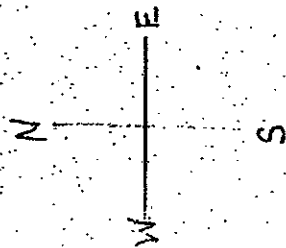
Name Pump Masters Inc. Telephone 318-425-1557  
 Address 405 Creswell St. City/State Shreveport, La  
 EPA ID  State ID

I certify that I have received into this facility the above listed waste.

Site operator name (Print) Tommy Gregorczyk  
6-15-93 Tommy Gregorczyk  
 Date Received Site Operator Signature







⊗ MARK LOCATION SOIL SAMPLE  
TAKEN

LH-1 2' BELOW TANK BOTTOM

GRASS AREA

BOILER  
ROOM  
BLUG 703-5

LH-2 ⊗  
LH-3 ⊗  
10,000 GALS  
U.S.T.  
DIESEL  
LH-4 ⊗  
LH-5 ⊗

ASPHALT  
DRIVE-WAY

BLUG

ADMINISTRATION  
AREA

PARKING  
LOT

PARKING  
LOT

***Attachment 4***

***Transformer Master Listing***

032373

024342

## TRANSFORMER MASTER LISTING

| MANUFACTURER     | SERIAL NO.     | LOCATION | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|----------------|----------|-------------|-------------|------------|----------|---------|
| MCGRW-EDISON     | 70BK289004     | 101      | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 1       |
| MCGRW-EDISON     | 70BK289007     | 101      | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 1       |
| MCGRW-EDISON     | 70BK289009     | 101      | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 1       |
| ALLIS-CHAMBERS   | 1901280        | 201      | PCB FREE    | 5/19/94     | 25.0       | 18.50    | 1       |
| ALLIS-CHAMBERS   | 1901282        | 201      | PCB FREE    | 5/19/94     | 25.0       | 18.50    | 1       |
| CENTRAL          | 1980-13        | 201      | PCB FREE    | 5/19/94     | 37.5       | 31.50    | 1       |
| MOLONEY          | 1320673        | 204      | 4.00        | 2/21/94     | 15.0       | 18.00    | 8       |
| MOLONEY          | 1308933        | 204      | PCB FREE    | 2/21/94     | 15.0       | 18.00    | 8       |
| MOLONEY          | 1310502        | 204      | PCB FREE    | 2/21/94     | 15.0       | 18.00    | 8       |
| MOLONEY          | 1307805        | 205      | PCB FREE    | 2/21/94     | 25.0       | 18.50    | 8       |
| GENERAL ELECTRIC | 8911288        | 206      | 33.00       | 7/18/96     | 100.0      | 75.00    | 1       |
| WESTINGHOUSE     | 71AL9540       | 206      | PCB FREE    | 10/30/95    | 100.0      | 75.00    | 1       |
| GENERAL ELECTRIC | 8911284        | 206      | 21.00       | 8/15/98     | 100.0      | 75.00    | 1       |
| MOLONEY          | 1308934        | 207      | 3.00        | 5/19/94     | 15.0       | 18.00    | 1       |
| MOLONEY          | 1308832        | 207      | 5.00        | 5/19/94     | 15.0       | 18.00    | 1       |
| CENTRAL          | 2324-5         | 207      | PCB FREE    | 5/19/94     | 25.0       | 18.50    | 1       |
| MOLONEY          | 1310498        | 207      | PCB FREE    | 5/19/94     | 15.0       | 18.00    | 1       |
| UNKNOWN          | LM128214       | 214      | PCB FREE    | 3/8/98      | 25.0       | 18.00    | 1       |
| WESTINGHOUSE     | 3157792        | 272      | 18.00       | 2/21/94     | 5.0        | 10.50    | 4       |
| WESTINGHOUSE     | 3157798        | 272      | 26.00       | 2/21/94     | 5.0        | 10.50    | 4       |
| ALPHA            | 89F07801       | 401      | PCB FREE    | NEW         | 187.0      |          | 9       |
| SUNBELT          | STO89464701    | 401      | PCB FREE    | NEW         | 300.0      |          | 9       |
| WESTINGHOUSE     | 3158921        | 414      | 4.00        | 4/15/98     | 3.0        | 10.50    | 8       |
| WESTINGHOUSE     | 3158923        | 414      | 5.00        | 4/15/98     | 3.0        | 10.50    | 8       |
| GENERAL ELECTRIC | 8050945GT      | 414      | 24.00       | 4/15/98     | 333.0      | 220.00   | 8       |
| WESTINGHOUSE     | 3153082        | 414      | 32.00       | 4/15/98     | 333.0      | 220.00   | 8       |
| WESTINGHOUSE     | 3153081        | 414      | 37.00       | 4/15/98     | 333.0      | 220.00   | 8       |
| WESTINGHOUSE     | 3153080        | 414      | 38.00       | 4/15/98     | 333.0      | 220.00   | 8       |
| ESCO             | 4331           | 414      | PCB FREE    | 4/15/98     | 7.5        | 10.00    | 8       |
| WESTINGHOUSE     | 82A081335      | 414      | PCB FREE    | 4/15/98     | 112.5      | 80.00    | 8       |
| WAGNER           | 368262 (TC-28) | 451      | PCB FREE    | 2/21/94     | 1.5        | 5.00     | 7       |
| WAGNER           | 347254 (TC-24) | 451      | PCB FREE    | 3/6/98      | 1.5        | 5.00     | 7       |
| WAGNER           | 365168 (TC-25) | 451      | PCB FREE    | 3/6/98      | 1.5        | 5.00     | 7       |

032374

024343

9/30/96

TRANSFOR. STER LISTING

| MANUFACTURER     | SERIAL NO.  | LOCATION  | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-------------|-----------|-------------|-------------|------------|----------|---------|
| ESCO             | 1126008     | 702       | PCB FREE    | 12/28/95    | 15.0       | 16.00    | 3       |
| ESCO             | 1126008     | 702       | PCB FREE    | 12/28/95    | 15.0       | 16.00    | 3       |
| UNKNOWN          | 941024872   | 702       | PCB FREE    | NEW         | 15.0       | 16.00    | 3       |
| WESTINGHOUSE     | 74G10544    | 703       | 27.00       | 3/8/96      | 100.0      |          | 3       |
| CENTRAL          | 2315-7      | 703       | PCB FREE    | 3/8/96      | 75.0       | 50.00    | 3       |
| LINE MATERIAL    | G3609518    | 705       | PCB FREE    | 3/8/96      | 100.0      | 75.00    | 3       |
| ALLIS-CHAMBERS   | 1801277     | 706       | 24.00       | 3/8/96      | 25.0       | 18.50    | 3       |
| WESTINGHOUSE     | 3198312     | 708       | 25.00       | 3/8/96      | 25.0       | 18.50    | 3       |
| ALLIS-CHAMBERS   | 1801279     | 708       | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 3       |
| ALLIS-CHAMBERS   | 1901281     | 708       | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 3       |
| MOLONEY          | 1307806     | 716       | PCB FREE    | 12/28/95    | 25.0       | 18.50    | 4       |
| GENERAL ELECTRIC | 85NRC0540   | 717       | 10.00       | 6/31/95     | 37.5       | 0.00     | 4       |
| CENTRAL          | 2781628-1   | 717       | PCB FREE    | 3/8/96      | 75.0       | 50.00    | 4       |
| CENTRAL          | 2781628-3   | 717       | PCB FREE    | 3/8/96      | 25.0       | 50.00    | 4       |
| CENTRAL          | 2781628-4   | 717       | PCB FREE    | 3/8/96      | 75.0       | 50.00    | 4       |
| CENTRAL          | 2440-2-12   | 719       | PCB FREE    | 2/21/94     |            |          | 3       |
| GENERAL ELECTRIC | G294740-65Y | 723       | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 4       |
| MOLONEY          | 1307804     | 723       | PCB FREE    | 5/19/94     | 25.0       | 18.50    | 4       |
| WESTINGHOUSE     | 76A341516   | 725       | PCB FREE    | 4/15/96     | 25.0       | 18.50    | 8       |
| CENTRAL MOLONEY  | 289232502   | 812       | PCB FREE    | NEW         | 25.0       | 18.50    | 7       |
| GENERAL ELECTRIC | N246021Y8TA | 812       | PCB FREE    | NEW         | 100.0      |          | 7       |
| GENERAL ELECTRIC | N259837YCTA | 812       | PCB FREE    | NEW         | 100.0      |          | 7       |
| WESTINGHOUSE     | 67AC2424    | 812       | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 7       |
| WESTINGHOUSE     | 67AC2430    | 812       | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 7       |
| SESCO            | 67ZN3884    | 813       | 4.00        | 12/28/95    | 100.0      | 75.00    | 7       |
| SESCO            | 67ZN3931    | 813       | PCB FREE    | 12/28/95    | 100.0      | 75.00    | 7       |
| SESCO            | 67ZN3932    | 813       | PCB FREE    | 12/28/95    | 100.0      | 75.00    | 7       |
| SESCO            | 67ZN3933    | 813       | PCB FREE    | 12/28/95    | 100.0      | 75.00    | 7       |
| UNKNOWN          | 3162822     | 814       | 31.00       | 4/15/96     | 75.0       |          | 7       |
| VANTRAN          | 74V2582     | 814       | PCB FREE    | 5/19/94     | 300.0      | 200.00   | 7       |
| WESTINGHOUSE     | A731ZAB0AA2 | 823       | PCB FREE    | 3/8/96      | 50.0       | 37.00    | 7       |
| MCGRAW-EDISON    | 8-03333-2-2 | 824       | PCB FREE    | 3/8/96      | 50.0       | 37.00    | 7       |
| WESTINGHOUSE     | 3165797     | 101 ANNEX | 18.00       | 3/8/96      | 50.0       | 37.00    | 1       |
| GENERAL ELECTRIC | G225118-65Y | 13-T      | PCB FREE    | 5/31/95     | 37.5       | 31.50    | 5       |

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## TRANSFORMER LISTING

| MANUFACTURER     | SERIAL NO.  | LOCATION                    | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-------------|-----------------------------|-------------|-------------|------------|----------|---------|
| WESTINGHOUSE     | 74AL4781    | 13-Y                        | PCB FREE    | 12/5/95     | 10         |          | 5       |
| ABB              | 90A490754   | 15-G                        | PCB FREE    | MFG. 12/90  | 50         |          | 5       |
| ABB              | 80A490758   | 15-G                        | PCB FREE    | MFG. 12/80  | 50         |          | 5       |
| ABB              | 90A490757   | 15-G                        | PCB FREE    | MFG. 12/80  | 50         |          | 5       |
| MOLONEY          | 1422323     | 15-K                        | PCB FREE    | 5/19/94     | 25.0       | 18.50    | 5       |
| ALLIS-CHAMBERS   | 1501268     | 16-T                        | PCB FREE    | 12/28/95    | 75.0       | 50.00    | 5       |
| CENTRAL          | 9383-18     | 16-T                        | PCB FREE    | 12/28/95    | 37.5       | 31.50    | 5       |
| MOLONEY          | 754933      | 16-T                        | PCB FREE    | 12/28/95    | 75.0       | 50.00    | 5       |
| WESTINGHOUSE     | 3182867     | 16-T                        | PCB FREE    | 12/28/95    | 75.0       | 50.00    | 5       |
| GENERAL ELECTRIC | G998440-67Y | 18-Y                        | PCB FREE    | 12/5/95     | 75.0       | 50.00    | 5       |
| GENERAL ELECTRIC | G998444-67Y | 18-Y                        | PCB FREE    | 12/5/95     | 75.0       | 50.00    | 5       |
| GENERAL ELECTRIC | H528465-67K | 18-Y                        | PCB FREE    | 12/5/95     | 75.0       | 50.00    | 5       |
| WESTINGHOUSE     | 71AG8828    | 18-K                        | 23.00       | 5/19/94     | 75.0       | 50.00    | 5       |
| WESTINGHOUSE     | 71AF4109    | 18-K                        | 29.00       | 5/19/94     | 75.0       | 50.00    | 5       |
| WESTINGHOUSE     | 71AF17895   | 18-K                        | 31.00       | 5/19/94     | 75.0       | 50.00    | 5       |
| COOPER           | 86J373157   | 18-Y                        | PCB FREE    | NEW         | 37.5       |          | 5       |
| COOPER           | 941132188   | 18-Y                        | PCB FREE    | MFG. 1994   | 25.0       | 389.0    | 5       |
| VANTRAN          | 84V4076     | 1ST ST. PAD (3RD PAD SPARE) | PCB FREE    | NEW         |            |          | NA      |
| UNKNOWN          | A7212A25AAK | 20-X                        | PCB FREE    | 3/5/96      | 25.0       |          | 7       |
| WESTINGHOUSE     | 89A182333   | 20-Y                        | PCB FREE    | NEW(1994)   | 37.5       | 38.00    | 5       |
| SESCO            | 67ZN3692    | 212-14                      | 3.00        | 12/26/95    | 37.5       | 31.50    | 1       |
| SESCO            | 67ZN3696    | 212-14                      | PCB FREE    | 12/26/95    | 167.0      | 125.00   | 1       |
| SESCO            | 67ZN3697    | 212-14                      | PCB FREE    | 12/26/95    | 167.0      | 125.00   | 1       |
| SESCO            | 67ZN3699    | 212-14                      | PCB FREE    | 12/26/95    | 167.0      | 125.00   | 1       |
| UNKNOWN          | 4335        | 212-20                      | PCB FREE    | 12/26/95    | 18.0       |          | 1       |
| CENTRAL          | 2388-2      | 212-38                      | PCB FREE    | 12/26/95    | 5.0        | 10.50    | 1       |
| ALAMO ATSCO      | D239127R    | 212-37                      | PCB FREE    | NEW         | 25.0       | 0.00     | 1       |
| ALAMO ATSCO      | E079154R    | 212-37                      | PCB FREE    | NEW         | 25.0       | 0.00     | 1       |
| ALAMO ATSCO      | E079156R    | 212-37                      | PCB FREE    | NEW         | 25.0       | 0.00     | 1       |
| WESTINGHOUSE     | 3158317     | 212-37                      | PCB FREE    | 12/26/95    | 37.5       | 31.50    | 1       |
| ESCO             | 5918891     | 22-A                        | PCB FREE    | 2/21/84     |            |          | 5       |
| ESCO             | 5918892     | 22-A                        | PCB FREE    | 2/21/84     |            |          | 5       |
| VANTRAN          | 61V3006     | 22-A                        | PCB FREE    | 2/21/84     | 15.0       | 16.00    | 5       |
| ALLIS-CHAMBERS   | 3070255     | 23-T                        | PCB FREE    | 10/30/95    | 75.0       | 50.00    | 5       |



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## TRANSFORMER LISTING

| MANUFACTURER     | SERIAL NO.  | LOCATION        | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-------------|-----------------|-------------|-------------|------------|----------|---------|
| CENTRAL          | 2440-2-9    | 25-C            | 8.00        | 3/8/98      | 15.0       | 16.00    | 5       |
| CENTRAL          | 2440-2-8    | 25-C            | 22.10       | NO OIL      | 15.0       | 16.00    | 5       |
| ALLIS-CHAMBERS   | 1901283     | 25-C            | PCB FREE    | 5/19/94     | 100.0      | 75.00    | 5       |
| ALLIS-CHAMBERS   | 1901285     | 25-C            | PCB FREE    | 5/19/94     | 100.0      | 75.00    | 5       |
| CENTRAL          | 2440-7-3    | 25-D            | 8.00        | 3/8/98      | 50.0       | 37.00    | 5       |
| ALLIS-CHAMBERS   | 2813088     | 25-D            | PCB FREE    | 3/8/98      | 50.0       | 37.00    | 5       |
| ALLIS-CHAMBERS   | 2813227     | 25-D            | PCB FREE    | 3/8/98      | 50.0       | 37.00    | 5       |
| MCGRAW-EDISON    | 84NF078005  | 25-D            | PCB FREE    | 3/8/98      | 50.0       | 37.00    | 5       |
| ALLIS-CHAMBERS   | 3070273     | 25-T            | PCB FREE    | 3/8/98      | 50.0       | 37.00    | 5       |
| VANTRAN          | 88V4308     | 25-T            | PCB FREE    | NEW         | 100.0      | 0.00     | 5       |
| VANTRAN          | 88V4309     | 25-T            | PCB FREE    | NEW         | 100.0      | 0.00     | 5       |
| VANTRAN          | 88V4310     | 25-T            | PCB FREE    | NEW         | 100.0      | 0.00     | 5       |
| UNKNOWN          | 880479-A1   | 25-T COMPRESSOR | PCB FREE    | N/A         | 1000.0     |          | 5       |
| GENERAL ELECTRIC | 225219      | 28-E            | PCB FREE    | 5/31/95     | 100.0      | 75.00    | 5       |
| GENERAL ELECTRIC | M228312     | 28-E            | PCB FREE    | 5/31/95     | 100.0      | 75.00    | 5       |
| GENERAL ELECTRIC | M228315     | 28-E            | PCB FREE    | 5/31/95     | 100.0      | 75.00    | 5       |
| WESTINGHOUSE     | 3182820     | 28-E            | PCB FREE    | 5/31/95     | 75.0       | 50.00    | 5       |
| ALLIS-CHAMBERS   | 2485486     | 28-G            | PCB FREE    | 5/19/94     | 75.0       | 50.00    | 5       |
| ALLIS-CHAMBERS   | 2485497     | 28-G            | PCB FREE    | 5/19/94     | 75.0       | 50.00    | 5       |
| ALLIS-CHAMBERS   | 2485502     | 28-G            | PCB FREE    | 5/19/94     | 75.0       | 50.00    | 5       |
| CENTRAL          | 1759-5-1    | 28-G            | PCB FREE    | 5/19/94     | 15.0       | 16.00    | 5       |
| CENTRAL          | 1759-5-2    | 28-G            | PCB FREE    | 5/19/94     | 15.0       | 16.00    | 5       |
| CENTRAL          | 1759-5-3    | 28-G            | PCB FREE    | 5/19/94     | 15.0       | 16.00    | 5       |
| CENTRAL          | 2113-7      | 28-G            | PCB FREE    | 10/26/95    | 50.0       | 37.00    | 5       |
| CENTRAL          | F-23076-1   | 28-A            | PCB FREE    | 3/8/98      | 50.0       |          | 5       |
| CENTRAL          | F-23076-3   | 28-A            | PCB FREE    | 3/8/98      | 50.0       |          | 5       |
| CENTRAL          | F-23076-5   | 28-A            | PCB FREE    | 3/8/98      | 50.0       |          | 5       |
| MCGRAW EDISON    | 84NH208-056 | 28-A            | PCB FREE    | N/A         | 25.0       |          | 5       |
| MCGRAW EDISON    | 84NL147-009 | 28-A            | PCB FREE    | N/A         | 25.0       |          | 5       |
| MCGRAW EDISON    | 84NH200-005 | 29-A            | PCB FREE    | N/A         | 25.0       |          | 5       |
| WESTINGHOUSE     | 77J608093   | 29-A            | PCB FREE    | N/A         | 167.0      |          | 5       |
| WESTINGHOUSE     | 3148282     | 29-D            | 25.00       | 3/8/98      | 167.0      |          | 5       |
| ALLIS-CHAMBERS   | 1871085     | 29-D            | PCB FREE    | 5/31/95     | 50.0       | 37.00    | 5       |
| ALLIS-CHAMBERS   | 1801551     | 29-D            | PCB FREE    | 5/31/95     | 50.0       | 37.00    | 5       |

## TRANSFORMER LISTING

| MANUFACTURER     | SERIAL NO.  | LOCATION     | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-------------|--------------|-------------|-------------|------------|----------|---------|
| ALLIS-CHAMBERS   | 1901552     | 29-D         | PCB FREE    | 5/31/85     | 50.0       | 37.50    | 5       |
| WESTINGHOUSE     | 3158310     | 3-Y          | 7.00        | 1/25/85     | 25.0       | 18.50    | 5       |
| LINE MATERIAL    | 281134      | 308-A        | PCB FREE    | 2/21/84     | 7.5        | 10.50    | 3       |
| CENTRAL          | 2332-30     | 31-M         | PCB FREE    | 5/31/85     | 25.0       | 18.50    | 5       |
| ALLIS-CHAMBERS   | 2725289     | 31-T         | 15.00       | 3/8/86      | 5.0        | 10.50    | 5       |
| ALLIS-CHAMBERS   | 2725302     | 31-T         | 18.00       | 3/8/86      | 5.0        | 10.50    | 5       |
| ALLIS-CHAMBERS   | 2731213     | 31-T         | PCB FREE    | 3/8/86      | 10.0       | 12.00    | 5       |
| WESTINGHOUSE     | 74H1272     | 31-W (SPARE) | 48.00       | 3/8/86      | 167.0      | 125.00   | NA      |
| COOPER           | 94NC803001  | 31-W (SPARE) | PCB FREE    | MANU. 1984  | 37.5       | 28       | NA      |
| GENERAL ELECTRIC | G422167-65K | 31-W (SPARE) | PCB FREE    | 3/8/86      | 25.0       | 395.00   | NA      |
| GENERAL ELECTRIC | N30B302YFTA | 31-W (SPARE) | PCB FREE    | 3/8/86      | 25.0       | 301.00   | NA      |
| GENERAL ELECTRIC | N383B50YKTA | 31-W (SPARE) | PCB FREE    | 3/8/86      | 25.0       | 355.00   | NA      |
| VANTRON          | 74V2587     | 31-W (SPARE) | PCB FREE    | 3/8/86      | 25.0       | 14.70    | NA      |
| VANTRON          | 81V3010     | 31-W (SPARE) | PCB FREE    | 3/8/86      | 167.0      | 57.00    | NA      |
| ESCO             | 4347        | 32-E         | PCB FREE    | 5/31/85     | 5.0        | 10.50    | 5       |
| ALLIS-CHAMBERS   | 1786551     | 32-H         | PCB FREE    | 5/31/85     | 50.0       | 37.00    | 5       |
| ALLIS-CHAMBERS   | 1901257     | 33-G         | PCB FREE    | 5/19/84     | 100.0      | 75.00    | 5       |
| ALLIS-CHAMBERS   | 1901284     | 33-G         | PCB FREE    | 5/19/84     | 100.0      | 75.00    | 5       |
| MOLONEY          | 748047      | 33-G         | PCB FREE    | 5/19/84     | 25.0       | 18.50    | 5       |
| CENTRAL          | 2351-1      | 33-W         | PCB FREE    | 5/31/85     | 15.0       | 18.00    | 5       |
| CENTRAL          | 2088-3-4    | 34-T         | PCB FREE    | 5/31/85     | 50.0       | 37.00    | 5       |
| SUNBELT          | 77A400351   | 34-T         | PCB FREE    | 5/31/85     | 25.0       |          | 5       |
| SUNBELT          | 80H058      | 34-T         | PCB FREE    | 5/31/85     | 25.0       |          | 5       |
| SUNBELT          | 81B1103     | 34-T         | PCB FREE    | 5/31/85     | 25.0       |          | 5       |
| WESTINGHOUSE     | 83AM5703    | 34-X         | 5.00        | 3/8/86      | 10.0       | 12.00    | 7       |
| GENERAL ELECTRIC | G572198-68K | 34-Y         | 5.00        | 1/25/85     | 37.5       | 31.50    | 5       |
| GENERAL ELECTRIC | G672198-68K | 34-Y         | 5.00        | 1/25/85     | 37.5       | 31.50    | 5       |
| GENERAL ELECTRIC | G442087-68Y | 34-Y         | PCB FREE    | 1/25/85     | 37.5       | 31.50    | 5       |
| CENTRAL          | 1980-22     | 35-B         | PCB FREE    | 5/31/85     | 25.0       | 18.50    | 5       |
| CENTRAL          | 2332-50     | 35-M         | PCB FREE    | 5/31/85     | 25.0       | 18.50    | 5       |
| CENTRAL          | 1980-1-1    | 35-W         | 8.00        | 5/31/85     | 10.0       | 12.00    | 5       |
| ESCO             | 4346        | 36-B         | PCB FREE    | 5/31/85     | 5.0        | 10.50    | 5       |
| WESTINGHOUSE     | 83AM5712    | 36-X         | PCB FREE    | 3/8/86      | 10.0       | 12.00    | 7       |
| GENERAL ELECTRIC | E104558-60Y | 37-E         | PCB FREE    | 5/31/85     | 100.0      | 75.00    | 5       |

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## TRANSFORMER LISTING

| MANUFACTURER     | SERIAL NO.      | LOCATION           | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-----------------|--------------------|-------------|-------------|------------|----------|---------|
| GENERAL ELECTRIC | E104559-60Y     | 37-E               | PCB FREE    | 5/31/85     | 100.0      | 75.00    | 5       |
| MCGRW-EDISON     | E104557-60Y     | 37-E               | PCB FREE    | 5/31/85     | 100.0      | 75.00    | 5       |
| MOLONEY          | 1422896         | 38-B               | 6.00        | 2/21/84     | 10.0       | 12.00    | 5       |
| MOLONEY          | 1422703         | 38-B               | 7.00        | 2/21/84     | 10.0       | 12.00    | 5       |
| GENERAL ELECTRIC | 1312387         | 38-B               | 8.00        | 2/21/84     | 10.0       | 12.00    | 5       |
| MCGRW-EDISON     | 69EG085008      | 38-Y               | PCB FREE    | 12/5/85     | 50         | 37       | 5       |
| MCGRW-EDISON     | 69B583508       | 38-Y               | PCB FREE    | 12/5/85     | 50.0       | 37.00    | 5       |
| MOLONEY          | 69B593507       | 38-Y               | PCB FREE    | 12/5/85     | 50.0       | 37.00    | 5       |
| RTE DISTRIBUTION | 891044482       | 38-Y               | PCB FREE    | NEW         | 50.0       | 37.00    | 5       |
| CENTRAL          | 2332-36         | 39-M               | PCB FREE    | 12/5/85     | 50.0       | 37.00    | 5       |
| GENERAL ELECTRIC | H696244Y89AA    | 39-T               | PCB FREE    | 5/31/85     | 25.0       | 18.50    | 5       |
| GENERAL ELECTRIC | H730858Y89AA    | 39-T               | PCB FREE    | 3/8/86      | 100.0      | 75.00    | 5       |
| GENERAL ELECTRIC | H730863Y89AA    | 39-T               | PCB FREE    | 3/8/86      | 100.0      | 75.00    | 5       |
| UNKNOWN          | 70BFQ53001      | 39-T               | PCB FREE    | 3/8/86      | 100.0      | 75.00    | 5       |
| WESTINGHOUSE     | 74F16885        | 4-Y                | 19.00       | 12/5/85     | 25.0       |          | 5       |
| CENTRAL          | 2098-9          | 400 AREA           | 5.00        | 10/30/85    | 50.0       | 37.00    | 5       |
| WESTINGHOUSE     | 8571477         | 400 AREA           | 13.00       | 12/5/85     | 10.0       | 12.00    | 1       |
| WESTINGHOUSE     | 8574819         | 400 AREA           | 28.00       | 12/5/85     | 37.5       | 31.50    | 1       |
| MOLONEY          | 704040          | 400 AREA           | PCB FREE    | 12/5/85     | 50.0       | 37.00    | 1       |
| MOLONEY          | 704042          | 400 AREA           | PCB FREE    | 12/5/85     | 37.5       | 31.50    | 1       |
| MOLONEY          | 704043          | 400 AREA           | PCB FREE    | 12/5/85     | 37.5       | 31.50    | 1       |
| WESTINGHOUSE     | 8481237         | 400 AREA           | PCB FREE    | 12/5/85     | 37.5       | 31.50    | 1       |
| UNKNOWN          | 78NJ089-007     | 401-C              | PCB FREE    | 3/8/86      | 50.0       | 37.00    | 1       |
| UNKNOWN          | 79NJ089-010     | 401-C              | PCB FREE    | 3/8/86      | 25.0       |          | 4       |
| UNKNOWN          | 78NG218-002     | 401-C              | PCB FREE    | 3/8/86      | 25.0       |          | 4       |
| GENERAL ELECTRIC | K6206224(201-1) | 405-L              | 2.00        | 10/30/85    | 25.0       |          | 4       |
| GENERAL ELECTRIC | K6206224(202-1) | 405-L              | 2.00        | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| GENERAL ELECTRIC | K6206224(202-2) | 405-L              | PCB FREE    | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| GENERAL ELECTRIC | K6206224(202-3) | 405-L              | PCB FREE    | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| GENERAL ELECTRIC | K6206224(201-2) | 405-L              | PCB FREE    | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| GENERAL ELECTRIC | K6206224(201-3) | 405-L              | PCB FREE    | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| MOLONEY          | 704738          | 405-L (SUBSTATION) | PCB FREE    | 10/30/85    | 69.0       | 45.00    | PRIMARY |
| MOLONEY          | 704739          | 405-L (SUBSTATION) | PCB FREE    | 10/30/85    | 10.0       | 12.00    | PRIMARY |
| ALLIS-CHAMBERS   | 2708841         | 41-W               | PCB FREE    | 5/19/84     | 10.0       | 12.00    | PRIMARY |
|                  |                 |                    |             |             | 15.0       | 18.00    | 5       |

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## TRANSFORMER LISTING

| MANUFACTURER     | SERIAL NO.   | LOCATION               | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|--------------|------------------------|-------------|-------------|------------|----------|---------|
| ALLIS-CHAMBERS   | 2706881      | 41-W                   | PCB FREE    | 5/19/94     | 15.0       | 18.00    | 5       |
| ALLIS-CHAMBERS   | 2706885      | 41-W                   | PCB FREE    | 5/19/94     | 15.0       | 18.00    | 5       |
| GENERAL ELECTRIC | 6607368      | 413-A                  | 12.00       | 5/22/98     | 37.5       | 31.50    | 4       |
| GENERAL ELECTRIC | 6607370      | 413-A                  | 15.00       | 5/22/98     | 37.5       | 31.50    | 4       |
| GENERAL ELECTRIC | 6709121      | 413-A                  | 41.00       | 12/28/95    | 25.0       | 18.50    | 4       |
| CENTRAL          | 3918-8       | 413-A                  | PCB FREE    | 12/28/95    | 50.0       | 37.00    | 4       |
| CENTRAL          | 3918-9       | 413-A                  | PCB FREE    | 12/28/95    | 50.0       | 37.00    | 4       |
| GENERAL ELECTRIC | 6607371      | 413-A                  | PCB FREE    | 5/24/98     | 37.5       | 31.50    | 4       |
| GENERAL ELECTRIC | N337886YGT   | 413-A (NEW IN STORAGE) | PCB FREE    | NEW         | 10.0       | 12.00    | NA      |
| GENERAL ELECTRIC | H660200Y88AA | 42-E                   | PCB FREE    | 5/19/94     | 100.0      | 75.00    | 5       |
| GENERAL ELECTRIC | H660201Y88AA | 42-E                   | PCB FREE    | 5/19/94     | 100.0      | 75.00    | 5       |
| VANTRAN          | 51V3009      | 42-E                   | PCB FREE    | 5/19/94     | 100.00     |          | 5       |
| CENTRAL          | 2332825      | 42-H                   | PCB FREE    | 10/30/95    | 25.0       | 18.50    | 2       |
| WESTINGHOUSE     | 88A232716    | 44-T                   | PCB FREE    | MFG 8/88    | 100.0      |          | 5       |
| WESTINGHOUSE     | 88A280864    | 44-T                   | PCB FREE    | MFG 8/88    | 100.0      |          | 5       |
| WESTINGHOUSE     | 88A280863    | 44-T                   | PCB FREE    | MFG 8/88    | 100.0      |          | 5       |
| CENTRAL          | 2440-17      | 44-W                   | 14.00       | 12/28/95    | 10.0       | 12.00    | 5       |
| CENTRAL          | 2332-28      | 44-W                   | PCB FREE    | 12/28/95    | 25.0       | 18.50    | 5       |
| CENTRAL          | 2440-1-13    | 44-W                   | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 5       |
| CENTRAL          | 2440-1-6     | 44-W                   | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 5       |
| ALLIS-CHAMBERS   | 3118844      | 45-E                   | 6.00        | 10/30/95    | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS   | 3070057      | 45-E                   | 6.00        | 7/18/96     | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS   | 3042817      | 45-E                   | 18.00       | 10/30/95    | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS   | 3041143      | 45-E                   | PCB FREE    | 10/30/95    | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS   | 3041145      | 45-E                   | PCB FREE    | 10/30/95    | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS   | 3070123      | 45-E                   | PCB FREE    | 10/30/95    | 100.0      | 75.00    | 2       |
| ESCO             | 4336         | 45-Y                   | PCB FREE    | 12/5/95     | 15.0       | 18.00    | 5       |
| ESCO             | 4337         | 45-Y                   | PCB FREE    | 12/5/95     | 15.0       | 18.00    | 5       |
| ESCO             | 4338         | 45-Y                   | PCB FREE    | 12/5/95     | 15.0       | 18.00    | 5       |
| UNKNOWN          | TC-20        | 451 (CIRCUIT BREAKER)  | PCB FREE    | 3/8/98      | N/A        | 2.00     |         |
| UNKNOWN          | TC-21        | 451 (CIRCUIT BREAKER)  | PCB FREE    | 3/8/98      | N/A        | 2.00     |         |
| UNKNOWN          | TC-22        | 451 (CIRCUIT BREAKER)  | PCB FREE    | 3/8/98      | N/A        | 2.00     |         |
| UNKNOWN          | TC-23        | 451 (CIRCUIT BREAKER)  | PCB FREE    | 3/8/98      | N/A        | 2.00     |         |
| ALLIS-CHAMBERS   | 3073563      | 46-A                   | PCB FREE    | 5/31/95     | 25.0       | 18.50    | 2       |

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## TRANSFORMER JETER LISTING

| MANUFACTURER     | SERIAL NO.  | LOCATION          | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|------------------|-------------|-------------------|-------------|-------------|------------|----------|---------|
| ESCO             | 10918693    | 46-A              | PCB FREE    | 5/31/85     | 25.0       |          | 2       |
| ALLIS-CHAMBERS   | 3102209     | 46-B              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 2       |
| ALLIS-CHAMBERS   | 3102218     | 46-B              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 2       |
| ALLIS-CHAMBERS   | 3102227     | 46-B              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 2       |
| ALLIS-CHAMBERS   | 308323      | 46-B              | PCB FREE    | 12/28/85    | 5.0        | 10.50    | 2       |
| ALLIS-CHAMBERS   | 308378      | 46-B              | PCB FREE    | 12/28/85    | 5.0        | 10.50    | 2       |
| ALLIS-CHAMBERS   | 308422      | 46-B              | PCB FREE    | 12/28/85    | 5.0        | 10.50    | 2       |
| WESTINGHOUSE     | 3165788     | 46-W              | 15.00       | 2/21/84     | 50.0       | 37.00    | 5       |
| ESCO             | 3811109     | 46-W              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 5       |
| ESCO             | 3811110     | 46-W              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 5       |
| ESCO             | 3811111     | 46-W              | PCB FREE    | 2/21/84     | 15.0       | 18.00    | 5       |
| WESTINGHOUSE     | 7128889     | 46W, 5/HB1        | PCB FREE    | 2/21/84     | 37.5       | 31.50    | 5       |
| WESTINGHOUSE     | 3167785     | 48-G              | 14.00       | 12/28/85    | 5.0        | 10.50    | 2       |
| WESTINGHOUSE     | 3167788     | 48-G              | 16.00       | 12/28/85    | 5.0        | 10.50    | 2       |
| ESCO             | 8813089     | 48-W              | PCB FREE    | 2/21/84     | 50.0       | 37.00    | 7       |
| ALLIS-CHAMBERS   | 0055183     | 48-B              | PCB FREE    | 3/8/88      | 15.0       | 16.00    | 2       |
| GENERAL ELECTRIC | D882655-88Y | 49-B              | PCB FREE    | 2/21/84     | 50.0       | 37.00    | 2       |
| GENERAL ELECTRIC | D883188-87Y | 49-B              | PCB FREE    | 12/28/85    | 15.0       | 16.00    | 2       |
| GENERAL ELECTRIC | D88142-87Y  | 49-B              | PCB FREE    | 12/28/85    | 15.0       | 16.00    | 2       |
| GENERAL ELECTRIC | D88143-87Y  | 49-B              | PCB FREE    | 12/28/85    | 15.0       | 16.00    | 2       |
| COPPER IND.      | CP821085825 | 49-W              | PCB FREE    | NEW         | 25.0       | 18.50    | 7       |
| GENERAL ELECTRIC | G438009-88Y | 49-W              | PCB FREE    | 4/15/88     | 25.0       | 18.50    | 7       |
| GENERAL ELECTRIC | G468387-88Y | 49-W              | PCB FREE    | 4/15/88     | 25.0       | 18.50    | 7       |
| GENERAL ELECTRIC | G468393-88Y | 49-W              | PCB FREE    | 4/15/88     | 25.0       | 18.50    | 7       |
| KUHLMAN          | C11482      | 50-G              | PCB FREE    | 5/31/85     | 50.0       | 32.00    | 2       |
| KUHLMAN          | C11482      | 50-G              | PCB FREE    | NEW         | 50.0       |          | 2       |
| VANTRAN          | 74V2588     | 50-G              | PCB FREE    | 5/31/85     | 25.0       |          | 2       |
| MOLONEY          | 701570      | 503-C(WATER TANK) | 15.00       | 3/8/86      | 5.0        | 10.50    | 3       |
| ESCO             | 7128470     | 53-D              | PCB FREE    | 12/28/85    | 15.0       | 16.00    | 2       |
| CENTRAL          | 2324-1      | 54-F              | PCB FREE    | 10/30/85    | 25.0       | 18.50    | 2       |
| GENERAL ELECTRIC | N889128YCY  | 54-F              | PCB FREE    | 10/30/85    | 50.0       |          | 2       |
| GENERAL ELECTRIC | N889128YCY  | 54-F              | PCB FREE    | 10/30/85    | 50.0       |          | 2       |
| GENERAL ELECTRIC | N889130YCY  | 54-F              | PCB FREE    | 10/30/85    | 50.0       |          | 2       |
| GENERAL ELECTRIC | N889130YCY  | 54-F              | PCB FREE    | 10/30/85    | 50.0       |          | 2       |
| CENTRAL          | 1980-39     | 54-G              | PCB FREE    | 3/8/86      | 37.5       | 31.50    | 2       |



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## TRANSFORMER LISTING

| MANUFACTURER   | SERIAL NO.  | LOCATION        | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|----------------|-------------|-----------------|-------------|-------------|------------|----------|---------|
| SESCO          | 672N3688    | 54-G            | PCB FREE    | N/A         | 167.0      | 125.00   | 2       |
| SESCO          | 672N8709    | 54-G            | PCB FREE    | N/A         | 167.0      | 125.00   | 2       |
| MOLONEY        | 908278      | 54-G, S.L. BANK | 9.00        | 2/21/84     | 20.0       | 18.50    | 2       |
| SOUTH BEND     | 34385       | 54-G, S.L. BANK | PCB FREE    | 2/21/84     |            |          | 2       |
| CENTRAL        | 2440-7-1    | 54-H            | 13.00       | 12/28/85    | 50.0       | 37.00    | 2       |
| CENTRAL        | 1349-3-1    | 54-H            | PCB FREE    | 5/19/84     | 37.5       | 44.00    | 2       |
| UNKNOWN        | N384076YKTA | 54-H            | PCB FREE    | 12/28/85    | 37.5       |          | 2       |
| VANTRAN        | 81V3008     | 54-H            | PCB FREE    | 12/28/85    | 37.5       | 31.50    | 2       |
| GREENVILLE     | 91-308-1    | 55-B            | PCB FREE    | NEW         | 100.0      |          | 2       |
| WESTINGHOUSE   | 3157788     | 801-B           | 15.00       | 4/15/88     | 5.0        | 10.50    | 7       |
| CENTRAL        | 2332-2      | 81-J            | PCB FREE    | 2/21/84     | 75.0       | 50.00    | 2       |
| UNKNOWN        | N711809-YCK | 62-D            | PCB FREE    | 3/8/86      | 10.0       |          | 5       |
| WAGNER         | 5N43289     | 62-D            | PCB FREE    | 5/31/85     | 15.0       | 18.00    | 2       |
| WAGNER         | 5N43306     | 62-D            | PCB FREE    | 5/31/85     | 15.0       | 18.00    | 2       |
| WAGNER         | 5N43307     | 62-D            | PCB FREE    | 5/31/85     | 15.0       | 18.00    | 2       |
| WAGNER         | 5P11888     | 62-D            | PCB FREE    | 5/31/85     | 37.5       | 31.50    | 2       |
| ALLIS-CHAMBERS | 2493655     | 62-G            | 2.00        | 2/21/84     | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS | 2495051     | 62-G            | PCB FREE    | 2/21/84     | 100.0      | 75.00    | 2       |
| ALLIS-CHAMBERS | 2495072     | 62-G            | PCB FREE    | 2/21/84     | 100.0      | 75.00    | 2       |
| CENTRAL        | 2332-44     | 62-G            | PCB FREE    | 2/21/84     | 25.0       | 18.50    | 2       |
| WESTINGHOUSE   | 76A253011   | 631-A           | PCB FREE    | 4/15/88     | 18.0       | 12.00    | 8       |
| WESTINGHOUSE   | 76A253010   | 631-A           | PCB FREE    | 4/15/88     | 10.0       | 12.00    | 8       |
| WESTINGHOUSE   | 76A253010   | 631-A           | PCB FREE    | 4/15/88     | 10.0       | 12.00    | 8       |
| ESCO           | 5127260     | 88-C            | 12.00       | 12/28/85    | 37.5       | 31.50    | 2       |
| LINE MATERIAL  | G8980801    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| LINE MATERIAL  | G8980804    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| LINE MATERIAL  | G8980905    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| WESTINGHOUSE   | 68AH2134    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| WESTINGHOUSE   | 68AH2135    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| WESTINGHOUSE   | 68AH2136    | 88-C            | PCB FREE    | 5/19/84     | 37.5       | 31.50    | 2       |
| CENTRAL        | 2440-3-1    | 88-F            | 7.00        | 5/31/85     | 25.0       | 18.50    | 2       |
| CENTRAL        | 2440-3-2    | 88-F            | 9.00        | 5/31/85     | 25.0       | 18.50    | 2       |
| CENTRAL        | 2383-17     | 88-F            | PCB FREE    | 5/31/85     | 37.5       | 31.50    | 2       |
| SESCO          | 67H8984     | 88-G            | 7.00        | 5/31/85     | 75.0       | 50.00    | 2       |

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## TRANSFOA .ASTER LISTING

| MANUFACTURER        | SERIAL NO.  | LOCATION | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|---------------------|-------------|----------|-------------|-------------|------------|----------|---------|
| WESTINGHOUSE        | 67G11266    | 68-G     | 22.00       | 5/31/95     | 250.0      | 175.00   | 2       |
| WESTINGHOUSE        | 67H10068    | 68-G     | 22.00       | 5/31/95     | 250.0      | 175.00   | 2       |
| WESTINGHOUSE        | 76A343411   | 68-G     | PCB FREE    | 5/31/95     | 25.0       |          | 2       |
| WESTINGHOUSE        | 74H14517    | 703-A    | 26.00       | 3/6/96      | 100.0      | 75.00    | 3       |
| WESTINGHOUSE        | 74H14521    | 703-A    | 31.00       | 3/6/96      | 100.0      | 75.00    | 3       |
| GRNVILL TRANSFORMER | 91-308-2    | 703-A    | PCB FREE    | 3/6/96      | 100.0      | 45.00    | 3       |
| WESTINGHOUSE        | 3158308     | 703-A    | PCB FREE    | 3/6/96      | 25.0       | 18.50    | 3       |
| ESCO                | 1126009     | 703-B    | PCB FREE    | 3/6/96      | 37.5       | 31.50    | 3       |
| ESCO                | 1126010     | 703-B    | PCB FREE    | 3/6/96      | 37.5       | 31.50    | 3       |
| ESCO                | 1126011     | 703-B    | PCB FREE    | 3/6/96      | 37.5       | 31.50    | 3       |
| GENERAL ELECTRIC    | N755584-YFX | 703-D    | PCB FREE    | MFG.8/84    | 50.0       |          | 3       |
| GENERAL ELECTRIC    | N755578-YFX | 703-D    | PCB FREE    | MFG.8/84    | 50.0       |          | 3       |
| GENERAL ELECTRIC    | N755562-YFX | 703-D    | PCB FREE    | MFG.8/84    | 50.0       |          | 3       |
| GENERAL ELECTRIC    | P088812-YOA | 703-E    | PCB FREE    | NEW         | 75.0       |          | 3       |
| GENERAL ELECTRIC    | P088815-YOA | 703-E    | PCB FREE    | NEW         | 75.0       |          | 3       |
| GENERAL ELECTRIC    | P088813-YOA | 703-E    | PCB FREE    | NEW         | 75.0       |          | 3       |
| EISLER              | 48381-J     | 704-D    | 13.00       | 5/19/94     | 37.5       | 31.50    | 4       |
| ALLIS-CHAMBERS      | 1848589     | 707-A    | 4.00        | 4/15/98     | 15.0       | 16.00    | 7       |
| UNKNOWN             | 921023244   | 707-C    | 49.90       | NEW         | 10.0       | 10.00    | 7       |
| CENTRAL             | 2351-2      | 709-A    | PCB FREE    | 12/26/95    | 25.0       | 16.00    | 2       |
| SESCO               | 672N3693    | 720-A    | 4.00        | 2/21/94     | 75.0       | 50.00    | 3       |
| MOLONEY             | 700757      | 720-A    | 18.00       | 2/21/94     | 5.0        | 10.50    | 3       |
| MOLONEY             | 700784      | 720-A    | 17.00       | 2/21/94     | 5.0        | 10.50    | 3       |
| LINE MATERIAL       | 312144      | 744-A    | PCB FREE    | 12/26/95    | 15.0       | 16.00    | 4       |
| LINE MATERIAL       | 312151      | 744-A    | PCB FREE    | 12/26/95    | 15.0       | 16.00    | 4       |
| CENTRAL             | 2440-2-10   | 75-J     | 5.00        | 5/31/95     | 15.0       |          | 4       |
| CENTRAL             | 2440-2-3    | 75-J     | 15.00       | 5/31/95     | 15.0       | 18.00    | 2       |
| CENTRAL             | 2331-1      | 75-J     | PCB FREE    | 5/31/95     | 15.0       | 18.00    | 2       |
| ALLIS-CHAMBERS      | 2731218     | 8-T      | PCB FREE    | 2/21/94     | 10.0       | 12.00    | 5       |
| ALLIS-CHAMBERS      | 2731234     | 8-T      | PCB FREE    | 2/21/94     | 10.0       | 12.00    | 5       |
| UNKNOWN             | 90A490102   | 8-T      | PCB FREE    | MFG. 11/90  | 10.0       |          | 5       |
| UNKNOWN             | 90A490100   | 8-T      | PCB FREE    | MFG. 11/90  | 10.0       |          | 5       |
| UNKNOWN             | 90A490101   | 8-T      | PCB FREE    | MFG. 11/90  | 10.0       |          | 5       |
| LINE MATERIAL       | G3724510    | 82-G     | PCB FREE    | 3/6/96      | 25.0       | 18.50    | 2       |

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## TRANSFORMER LISTING

| MANUFACTURER      | SERIAL NO.  | LOCATION                     | PCB CONTENT | DATE TESTED | KVA RATING | CAPACITY | CIRCUIT |
|-------------------|-------------|------------------------------|-------------|-------------|------------|----------|---------|
| MOLONEY           | 1228285     | 821-A                        | 3.00        | 4/15/88     | 10.0       | 12.00    | 7       |
| MOLONEY           | 1228284     | 821-A                        | 5.00        | 4/15/88     | 10.0       | 12.00    | 7       |
| MOLONEY           | 1228282     | 821-A                        | 8.00        | 4/15/88     | 10.0       | 12.00    | 7       |
| UNKNOWN           | 3687715     | <i>Groundwater treatment</i> | 3.00        | 4/15/88     | 10.0       | 12.00    | 5       |
| MCGRAW-EDISON     | 69B2337005  | AIR HORN Y-AREA              | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 5       |
| MCGRAW-EDISON     | 70B8728004  | AIR HORN Y-AREA              | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 5       |
| MCGRAW-EDISON     | 70B8728003  | AIR HORN Y-AREA              | PCB FREE    | 12/28/95    | 10.0       | 12.00    | 5       |
| WESTINGHOUSE      | 3157787     | B-10                         | 10.00       | 12/28/95    | 5.0        | 10.50    | 1       |
| GENERAL ELECTRIC  | G431710-85K | B-10                         | PCB FREE    | 12/28/95    | 167        |          | 1       |
| GENERAL ELECTRIC  | G431711-85K | B-10                         | PCB FREE    | 12/28/95    | 167.0      | 125.00   | 1       |
| GENERAL ELECTRIC  | G571598-86K | B-10                         | PCB FREE    | 12/28/95    | 167        |          | 1       |
| WESTINGHOUSE      | 74H12787    | B-16                         | 29.00       | 12/28/95    | 167        |          | 1       |
| WESTINGHOUSE      | 3157784     | B-7                          | 8.00        | 12/28/95    | 5.0        | 10.50    | 1       |
| GENERAL ELECTRIC  | M634891YJPA | BG #3                        | PCB FREE    | 3/8/96      | 50.0       | 37.00    | 7       |
| GENERAL ELECTRIC  | M634892YJPA | BG #3                        | PCB FREE    | 3/8/96      | 50.0       | 37.00    | 7       |
| GENERAL ELECTRIC  | M648475YKPA | BG #3                        | PCB FREE    | 3/8/96      | 50.0       | 37.00    | 7       |
| WESTINGHOUSE      | 3157783     | BG#1 POLE 7239               | PCB FREE    | 2/21/94     | 5.0        | 10.50    | 7       |
| GENERAL ELECTRIC  | 6422167-85K | BLD. 723                     | PCB FREE    | 3/8/96      | 25.0       | 18.50    | 4       |
| GENERAL ELECTRIC  | 9688046     | BREAKER (S.L. BANK 212-12)   | PCB FREE    | 2/21/94     | 15.0       |          | 1       |
| VANTRAN           | 74V2583     | BST AREA                     | PCB FREE    | 2/21/94     | 5.0        | 10.50    | 7       |
| STANDARD          | RIG-0585    | CB-1                         | PCB FREE    | 12/28/95    | 1500.0     |          | 8       |
| COOPER            | 931001557   | GROUNDWATER TREATMENT        | PCB FREE    | NEW         | 15         |          | 7       |
| GENERAL ELECTRIC  | P083934-YPA | GROUNDWATER TREATMENT        | PCB FREE    | NEW         | 50         |          | 7       |
| GENERAL ELECTRIC  | N88437-YAY  | GROUNDWATER TREATMENT        | PCB FREE    | NEW         | 75         |          | 7       |
| GREENVILLE TRANS. | 98-176-1    | HARRISON BAYOU PUMP          | PCB FREE    | NEW         | 15         |          | 7       |
| GREENVILLE TRANS. | 98-176-1A   | HARRISON BAYOU PUMP          | PCB FREE    | NEW         | 75         |          | 7       |
| GREENVILLE TRANS. | 98-176-3    | HARRISON BAYOU PUMP          | PCB FREE    | NEW         | 50         |          | 7       |
| GENERAL ELECTRIC  | C223609     | M-2                          | 41.00       | 12/28/95    | 25.0       | 18.50    | 1       |
| GENERAL ELECTRIC  | C223610     | M-2                          | 42.00       | 12/28/95    | 25.0       | 18.50    | 1       |
| MOLONEY           | 709762      | MAGAZINE DUNNAGE YARD 71E29  | 33.00       | 2/21/94     | 5.0        | 10.50    | 7       |
| STANDARD          | RIG-0491    | P-108                        | PCB FREE    | 12/28/95    | 112.5      | 100.00   | 6       |
| STANDARD          | RIG-0582    | P-116                        | PCB FREE    | 12/28/95    | 750.0      |          | 8       |
| STANDARD          | RIG-0583    | P-117                        | PCB FREE    | 12/28/95    | 750.0      |          | 8       |
| STANDARD          | RIG-0488    | P-118                        | PCB FREE    | 12/28/95    | 500.0      |          | 8       |

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| MANUFACTURER     | SERIAL NO.  | LOCATION              | PCB<br>CONTENT | DATE<br>TESTED | KVA<br>RATING | CAPACITY | CIRCUIT |
|------------------|-------------|-----------------------|----------------|----------------|---------------|----------|---------|
| STANDARD         | RIG-0500    | P-118                 | PCB FREE       | 12/28/95       | 225.0         | 150.00   | 6       |
| STANDARD         | RIG-0501    | P-129                 | PCB FREE       | 12/28/95       | 225.0         | 150.00   | 6       |
| STANDARD         | RIG-0712    | P-122                 | PCB FREE       | 12/28/95       | 300.0         | 200.00   | 6       |
| STANDARD         | RIG-0480    | P-123                 | PCB FREE       | 12/28/95       | 112.5         | 100.00   | 6       |
| GENERAL ELECTRIC | G209631-85Y | P-13                  | PCB FREE       | 1/25/95        | 100.0         | 75.00    | 1       |
| GENERAL ELECTRIC | G209634-85Y | P-13                  | PCB FREE       | 1/25/95        | 100.0         | 75.00    | 1       |
| WESTINGHOUSE     | 70J18274    | P-14                  | 47.00          | 1/25/95        | 250           | 175.00   | 1       |
| MCGRAW-EDISON    | 89B2201003  | POLE 3/10 CATH. PROT. | PCB FREE       | 12/28/95       | 5.0           | 10.50    | 3       |
| ALLUS-CHAMBERS   | 2470049     | POLE 3/828, BALLFIELD | 5.00           | 12/28/95       | 25.0          | 18.50    | 3       |
| UNKNOWN          | 3144153     | POLE 5-225, S.L. BANK | 18.00          | 3/8/96         | 25.0          |          | 5       |

***Attachment 5***

***Asbestos-Containing Materials Survey Reports***



**ASBESTOS CONTAINING BUILDING MATERIALS  
SURVEY REPORT**

**BUILDINGS: 703-B, 703-D, 720-C, and 702**

ASBESTOS SURVEY  
LHAAP  
DATE: JANUARY 13, 1995  
BLDG NO:

**FORM A**  
**(BUILDING SUMMARY REPORT)**

PAGE: 1 OF 1

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3/6/96

## ASBESTOS SURVEY

LHAAP

DATE: JANUARY 13, 1

## FORM C

(HOMOGENOUS AREA REPORT)

ADMINISTRATION AREA

| BLDG. NO. | ROOM/BAY NO. | HOMO. AREA. NO. | HOMOGENOUS AREA NAME OR DESCRIPTION | CLASSIFICATION SURFACING MAT'L THERM.SYS.INSUL OR MISC. MAT'L (SM/TSI/MM) | SIZE AREA SQUARE FEET/ LINEAR FEET (SF/LF) | FRIABLE NON-FRIABLE (F/NF) | ASBESTOS KNOWN/ ASSUMED/ NONE (K/A/N) |
|-----------|--------------|-----------------|-------------------------------------|---------------------------------------------------------------------------|--------------------------------------------|----------------------------|---------------------------------------|
| 703-A     | 1ST FLOOR    | 10              | STEAM LINE INSULATION               | TSI                                                                       | 228 LF +/-                                 | F                          | A                                     |
| 703-A     | 1ST FLOOR    | 13              | FLOOR TILE - 9 X 9                  | MM                                                                        | 9,500 SF +/-                               | NF                         | A                                     |
| 703-A     | 1ST FL RR    | 14              | LINOLEUM                            | MM                                                                        | 350 SF +/-                                 | NF                         | A                                     |
| 703-A     | 2ND FLOOR    | 13              | FLOOR TILE - 9 X 9                  | MM                                                                        | 9,500 SF +/-                               | NF                         | A                                     |
| 703-A     | 2ND FL RR    | 14              | LINOLEUM                            | MM                                                                        | 350 SF +/-                                 | NF                         | A                                     |
| 703-A     | STAIRS       | 13              | FLOOR TILE - 9 X 9                  | MM                                                                        | 600 SF +/-                                 | NF                         | A                                     |
| 703-A     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 6,000 SF +/-                               | NF                         | A                                     |
| 703-A     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 4,000 SF +/-                               | NF                         | A                                     |
| 703-A     | UNDER BLD    | 10              | STEAM LINE INSULATION               | TSI                                                                       | 1,000 LF +/-                               | F                          | K                                     |
| 704-A     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 1,500 SF +/-                               | NF                         | A                                     |
| 704-A     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 1,800 SF +/-                               | NF                         | A                                     |
| 720-A     |              | 1               | WATER LINE INSULATION               | TSI                                                                       | 12 LF +/-                                  | F                          | N                                     |
| 720-A     |              | 2               | CEILING TILE                        | MM                                                                        | 7,000 SF +/-                               | F                          | N                                     |
| 720-A     |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 8,400 SF +/-                               | NF                         | A                                     |
| 720-A     |              | 14              | LINOLEUM                            | MM                                                                        | 450 SF +/-                                 | NF                         | A                                     |
| 720-A     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 6,500 SF +/-                               | NF                         | K                                     |
| 720-A     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 9,500 SF +/-                               | NF                         | A                                     |
| 720-A     | UNDER BLD    | 10              | STEAM LINE INSULATION               | TSI                                                                       | 1,000 LF +/-                               | F                          | K                                     |
| 720-A     | UNDER BLD    | 1               | WATER LINE INSULATION               | TSI                                                                       | 12 LF +/-                                  | F                          | N                                     |
| 736-A     |              | 6               | CEILING TILE - 12 X 12              | MM                                                                        | 25 SF +/-                                  | F                          | N                                     |
| 736-A     |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 8,400 SF +/-                               | NF                         | A                                     |
| 736-A     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 2,700 SF +/-                               | NF                         | A                                     |
| 736-A     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 2,200 SF +/-                               | NF                         | A                                     |
| 736-A     | UNDER BLD    | 10              | STEAM LINE INSULATION               | TSI                                                                       | 1,000 LF +/-                               | F                          | K                                     |
| 703-B     |              | 13              | FLOOR TILE - 9 X 9                  | MM                                                                        | 8,400 SF +/-                               | NF                         | A                                     |
| 703-B     | ABV CLNG     | 7               | WATER LINE JOINT INSUL.             | TSI                                                                       | 20 LF +/-                                  | F                          | N                                     |
| 703-B     | MECH RM      | 11              | STEAM LINE JOINT INSUL.             | TSI                                                                       | 25 LF +/-                                  | F                          | N                                     |
| 708-B     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 500 SF +/-                                 | NF                         | A                                     |
| 708-B     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 115 SF +/-                                 | NF                         | A                                     |
| 703-C     |              | 4               | TRANSITE - CEILING/WALL             | MM                                                                        | 2,680 SF +/-                               | NF                         | K                                     |
| 703-C     |              | 10              | STEAM LINE INSULATION               | TSI                                                                       | 40 LF +/-                                  | F                          | K                                     |
| 703-C     |              | 11              | STEAM LINE JOINT INSUL.             | TSI                                                                       | 8 LF +/-                                   | F                          | K                                     |
| 703-C     |              | 12              | BOILER VENT INSULATION              | TSI                                                                       | 80 SF +/-                                  | F                          | N                                     |
| 703-C     |              | 3               | CORR. TRANSITE SIDING               | MM                                                                        | 1,800 SF +/-                               | NF                         | K                                     |
| 720-C     |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 300 SF +/-                                 | NF                         | A                                     |
| 720-C     |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 400 SF +/-                                 | NF                         | A                                     |
| 703-D     |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 1,300 SF +/-                               | NF                         | A                                     |
| 703-E     |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 1,900 SF +/-                               | NF                         | A                                     |
| 707-E     |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 1,500 SF +/-                               | NF                         | A                                     |
| 701       |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 2,200 SF +/-                               | NF                         | A                                     |
| 701       |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 2,000 SF +/-                               | NF                         | A                                     |
| 702       |              | 11              | STEAM LINE JOINT INSUL.             | TSI                                                                       | 6 LF +/-                                   | F                          | A                                     |
| 702       |              | 13              | FLOOR TILE - 9 X 9                  | MM                                                                        | 2,000 SF +/-                               | NF                         | A                                     |
| 703       | 1ST FLOOR    | 4               | FIRE DOOR                           | MM                                                                        | 200 SF +/-                                 | NF                         | A                                     |
| 703       | 1ST FLOOR    | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 9,500 SF +/-                               | NF                         | A                                     |
| 703       | 1ST FL RR    | 14              | LINOLEUM                            | MM                                                                        | 450 SF +/-                                 | NF                         | A                                     |
| 703       | 2ND FLOOR    | 4               | FIRE DOOR                           | MM                                                                        | 200 SF +/-                                 | NF                         | A                                     |
| 703       | 2ND FLOOR    | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 9,500 SF +/-                               | NF                         | A                                     |
| 703       | 2ND FL RR    | 14              | LINOLEUM                            | MM                                                                        | 450 SF +/-                                 | NF                         | A                                     |
| 703       | STAIRS       | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 600 SF +/-                                 | NF                         | A                                     |
| 703       |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 4,000 SF +/-                               | NF                         | A                                     |
| 703       |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 3,000 SF +/-                               | NF                         | A                                     |
| 705       |              | 13              | FLOOR TILE-9 X 9,12 X 1             | MM                                                                        | 2,000 SF +/-                               | NF                         | A                                     |
| 705       |              | 14              | LINOLEUM                            | MM                                                                        | 1,000 SF +/-                               | NF                         | A                                     |
| 705       |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 5,300 SF +/-                               | NF                         | A                                     |
| 705       |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 2,000 SF +/-                               | NF                         | A                                     |
| 708       | UNDER BLD    | 10              | STEAM LINE INSULATION               | TSI                                                                       | 125 LF +/-                                 | F                          | A                                     |
| 708       |              | 13              | FLOOR TILE - 12 X 12                | MM                                                                        | 4,200 SF +/-                               | NF                         | A                                     |
| 708       |              | 14              | LINOLEUM                            | MM                                                                        | 3,800 SF +/-                               | NF                         | A                                     |
| 708       | KITCHEN      | 4               | TRANSITE PANEL - WALLS              | MM                                                                        | 350 SF +/-                                 | NF                         | A                                     |
| 708       | BOILER RM    | 11              | STEAM LINE JOINT INSUL.             | TSI                                                                       | 4 LF +/-                                   | F                          | A                                     |
| 708       | BOILER RM    | 15              | HOT WATER TANK INSUL.               | TSI                                                                       | 75 SF +/-                                  | F                          | A                                     |
| 708       |              | 4               | TRANSITE SHINGLE SIDING             | MM                                                                        | 4,500 SF +/-                               | NF                         | A                                     |
| 708       |              | 5               | TAR SHINGLE ROOF                    | MM                                                                        | 3,000 SF +/-                               | NF                         | A                                     |
| 708       | OUTSIDE      | 10              | STEAM LINE INSULATION               | TSI                                                                       | 200 LF +/-                                 | F                          | K                                     |
| 708       | OUTSIDE      | 11              | STEAM LINE JOINT INSUL.             | TSI                                                                       | 10 LF +/-                                  | F                          | K                                     |

SHADING AND ITALICS INDICATE ACM REMOVED

ASBESTOS SURVEY  
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FORM D  
(SAMPLING LOG AND RESULTS)

PAGE 1 OF 1

| BLDG. # | HA # | SAMPLE NO. | SAMPLE LOCATION<br>PHYSICAL DESCRIPTION            | MANNER<br>USED TO<br>DETERMINE<br>SAMPLE<br>LOCATION | SAMPLE<br>INSPECTOR<br>(SIGNATURE F/<br>MASTER COPY<br>ONLY) | SAMPLE<br>DATE | ANALYSIS<br>LABORATORY<br>NAME | ANALYSIS<br>DATE | ANALYSIS RESULTS<br>(COPIES OF ANALYSIS<br>REPORTS ATTACHED) |
|---------|------|------------|----------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|----------------|--------------------------------|------------------|--------------------------------------------------------------|
| 720A    | 4    | 1          | TRANSITE SIDING PANEL - OUTSIDE                    | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 720A    | 1    | 1          | 2" WATER LINE INSULATION                           | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 720A*   | 1    | 1          | 2" WATER LINE INSULATION                           | RANDOM                                               | TPJ                                                          | 10/11/94       | EEG                            | 10/24/94         | NEGATIVE                                                     |
| 720A    | 2    | 1          | WHITE 2' X 4' CEILING TILE WITH<br>SMALL PIN HOLES | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 736A    | 6    | 1          | WHITE 12' X 12' CEILING TILE<br>WITH LARGE HOLES   | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 736A    | 1    | 1          | 2" HOT WATER LINE - UNDER BUILDING                 | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 719     | 1    | 1          | 4" WATER LINE -<br>OUTSIDE UNDERNEATH BUILDING     | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 719     | 7    | 1          | 4" WATER JOINT -<br>OUTSIDE UNDERNEATH BUILDING    | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 703C    | 12   | 1          | BOILER VENT INSULATION                             | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 703C    | 10   | 1          | 2" STEAM LINE                                      | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 703C    | 11   | 1          | 2" STEAM JOINT                                     | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 703C    | 4    | 1          | 3' X 6' TRANSITE PANEL                             | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 703C    | 3    | 1          | CORRUGATED TRANSITE SIDING                         | RANDOM                                               | TPJ                                                          | 10/11/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 703A    | 10   | 1          | STEAM LINE UNDER BUILDING (EAST SIDE)              | RANDOM                                               | TPJ                                                          | 11/01/94       | ARI                            | 11/08/94         | POSITIVE                                                     |
| 703B    | 11   | 1          | STEAM JOINT (MECHANICAL ROOM)                      | RANDOM                                               | TPJ                                                          | 11/01/94       | ARI                            | 11/08/94         | NEGATIVE                                                     |
| 703B    | 7    | 1          | WATER LINE JOINT<br>(ABOVE CEILING MEN'S BATHROOM) | RANDOM                                               | TPJ                                                          | 11/01/94       | ARI                            | 11/08/94         | NEGATIVE                                                     |
| 708     | 10   | 1          | STEAM LINE (OUTSIDE)                               | RANDOM                                               | TPJ                                                          | 11/01/94       | ARI                            | 11/08/94         | POSITIVE                                                     |
| 708     | 11   | 1          | STEAM JOINT (OUTSIDE)                              | RANDOM                                               | TPJ                                                          | 11/01/94       | ARI                            | 11/08/94         | POSITIVE                                                     |
|         |      |            |                                                    |                                                      |                                                              |                |                                |                  |                                                              |
|         |      |            |                                                    |                                                      |                                                              |                |                                |                  |                                                              |

\* - DUPLICATE SAMPLE









**FORM B**  
**(INPUT)**

**BUILDING NO.:**

**ROOM NO.:**

| 1. % DAMAGED               | 2. EXTENT OF DAMAGE        | 3. TYPE OF DAMAGE:                     | 4. FREQUENCY OF CONTACT: | 5. INFLUENCE OF VIBRATION:                                                                                                                                                                                                                                                                                                                         | 6. POTENTIAL FOR AIR EROSIONS:                                                                                                                                         | 7. ACCESSIBILITY                                                                                                                               | 8. ACTIVITY:                                                                                                                                                   | 9. AIR MOVEMENT:                            | 10. FRIABILITY:                                                                                                                                                                                                                                                | 11. MULTIPLE SHIFT RANKING:                                                          | 12. ESTIMATED AMOUNT OF MATERIAL: | 13. SUBSTRATE:                                                                                                                                                                                  |
|----------------------------|----------------------------|----------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| % Scattered or % Localized | L-Localized, D-Distributed | D-Decontamination, W-Water, P-Physical | High                     | High: Loud motors or engines present<br>e.g. some fan rooms) or<br>Moderate: B. Intrusive noises or easily sensed vibrations (e.g. major airport, major highway)<br>Low/None: A. Motors or engines present but not obtrusive (e.g. shops vibrating but no fan in the area) or<br>B. Occasional loud sounds (e.g. music room).<br>None of the above | High: High velocity air (e.g. elevator shaft, fan room)<br>Moderate: Noticeable movement of air (e.g. air shaft, ventilator air stream)<br>Low/None: None of the above | 0- Not accessible / beyond reach<br>1- Within reach / locked<br>2- Within reach / not easily accessible<br>3- Within reach / easily accessible | 0- Locked mechanical rooms<br>1- Keyed closets used during shift work<br>2- Private offices and restrooms<br>3- Hallways, lounges, yards, and other such areas | 0- None<br>1- Low<br>2- Moderate<br>3- High | 0- Mechanical assault to damage (e.g. striking with hammer, etc.)<br>1- Physical assault to damage (e.g. kicking the material)<br>2- Damage by hand touch (e.g. handle rubbing on material)<br>3- Damaged by air movement (e.g. sprayed on fireproofing, etc.) | 1- Open 8 hours per day<br>2- Open 8-16 hours per day<br>3- Open 16-24 hours per day | (Square Ft. or Linear Ft.)        | B- Bolter<br>C- Concrete<br>D- Ductwork<br>SR- Sheet Rock<br>P- Plaster<br>FF- Pipe Fitting<br>PS- Pipe (Straight)<br>SB- Steel Beams<br>SM- Sheet Metal<br>T- Tank<br>W- Wood<br>WM- Wire Mesh |

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FORM E (OUTPUT)  
(HOMOGENOUS AREA HAZARD ASSESSMENT)

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| BUILDING NO. | ROOM/BAY NO. | HOMOGENOUS AREA NO. | HOMOGENOUS AREA NAME/DESCRIPTION | HAZARD ASSESSMENT CLASSIFICATION | HAZARD RANKING | REASON F/ CLASSIFICATION | INSPECTOR'S NAME (SIGNATURE F/ MASTER COPY ONLY) | DATE     |
|--------------|--------------|---------------------|----------------------------------|----------------------------------|----------------|--------------------------|--------------------------------------------------|----------|
| 703-A        | 1ST FLOOR    | 10                  | STEAM LINE INSULATION            | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | 1ST FLOOR    | 13                  | FLOOR TILE - 9 X 9               | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | 1ST FL FR    | 14                  | LINOLEUM                         | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | 2ND FLOOR    | 13                  | FLOOR TILE - 9 X 9               | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | 2ND FL FR    | 14                  | LINOLEUM                         | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | STAIRS       | 13                  | FLOOR TILE - 9 X 9               | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        |              | 4                   | TRANSITE SHINGLE SIDING          | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-A        | UNDER BL     | 10                  | STEAM LINE INSULATION            | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 704-A        |              | 4                   | TRANSITE SHINGLE SIDING          | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 704-A        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        |              | 13                  | FLOOR TILE - 12 X 12             | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        |              | 14                  | LINOLEUM                         | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        |              | 4                   | TRANSITE SHINGLE SIDING          | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        | UNDER BL     | 1                   | WATER LINE INSULATION            | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-A        | UNDER BL     | 7                   | WATER LINE JOINT INSULATION      | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 736-A        |              | 13                  | FLOOR TILE - 9 X 9               | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 736-A        |              | 4                   | TRANSITE SHINGLE SIDING          | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 736-A        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 736-A        | UNDER BL     | 1                   | WATER LINE INSULATION            | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-B        |              | 13                  | FLOOR TILE - 9 X 9               | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708-B        |              | 4                   | TRANSITE SHINGLE SIDING          | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708-B        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-C        |              | 4                   | TRANSITE PANEL - CEILING & WALLS | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-C        |              | 10                  | STEAM LINE INSULATION            | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-C        |              | 11                  | STEAM LINE JOINT INSULATION      | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-C        |              | 3                   | CORRUGATED TRANSITE SIDING       | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-C        |              | 13                  | FLOOR TILE - 12 X 12             | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 720-C        |              | 5                   | TAR SHINGLE ROOF                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-D        |              | 13                  | FLOOR TILE - 12 X 12 & 9 X 9     | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703-E        |              | 13                  | FLOOR TILE - 12 X 12             | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 701-E        |              | 4                   | TRANSITE SHINGLE SIDING          | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 701          |              | 4                   | TRANSITE SHINGLE SIDING          | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |

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FORM E (OUTPUT)  
(HOMOGENEOUS AREA HAZARD ASSESSMENT)

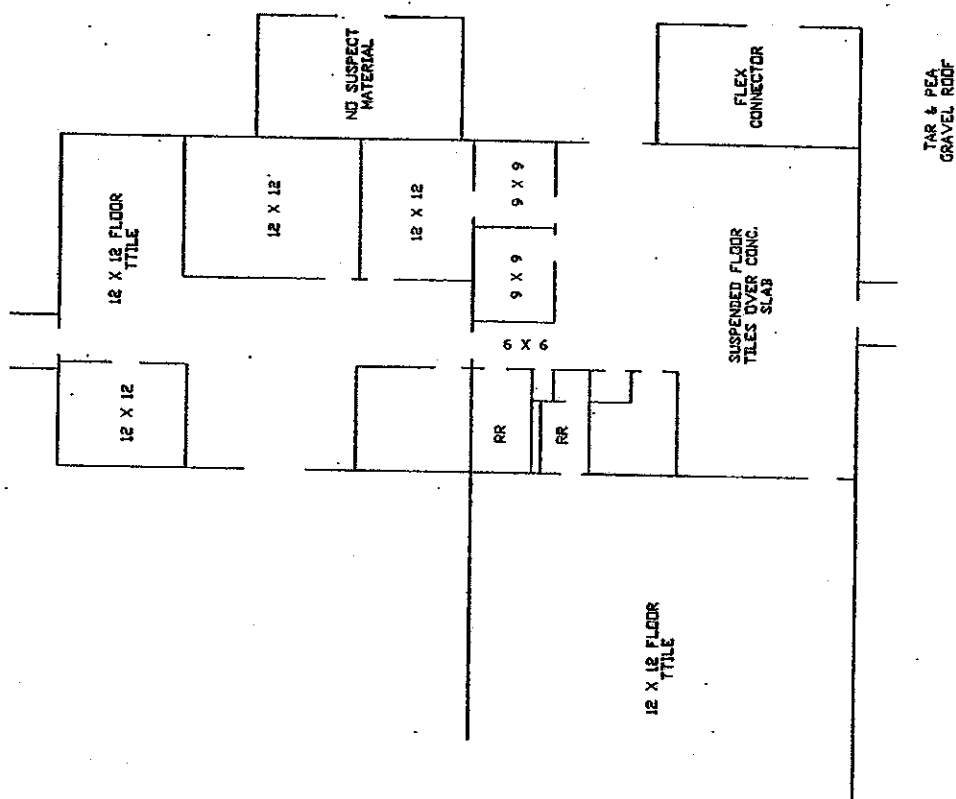
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| BUILDING NO. | ROOM/BAY NO. | HOMOGENEOUS AREA NO. | HOMOGENEOUS AREA NAME/DESCRIPTION | HAZARD ASSESSMENT CLASSIFICATION | HAZARD RANKING | REASON F/ CLASSIFICATION | INSPECTOR'S NAME (SIGNATURE F/ MASTER COPY ONLY) | DATE     |
|--------------|--------------|----------------------|-----------------------------------|----------------------------------|----------------|--------------------------|--------------------------------------------------|----------|
| 701          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 702          |              | 11                   | STEAM LINE JOINT INSULATION       | DAMAGE                           | 6              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 702          |              | 13                   | FLOOR TILE - 8 X 9                | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 1ST FLOOR    | 4                    | FIRE DOOR                         | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 1ST FLOOR    | 13                   | FLOOR TILE - 12 X 12              | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 1ST FL FR    | 14                   | LINOLEUM                          | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 2ND FLOOR    | 4                    | FIRE DOOR                         | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 2ND FLOOR    | 13                   | FLOOR TILE - 12 X 12              | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | 2ND FL FR    | 14                   | LINOLEUM                          | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          | STAIRS       | 13                   | FLOOR TILE - 12 X 12              | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          |              | 4                    | TRANSITE SHINGLES SIDING          | DAMAGE                           | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 703          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          |              | 7                    | WATER LINE JOINT INSULATION       | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          |              | 13                   | FLOOR TILE - 9 X 9 & 12 X 12      | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          |              | 14                   | LINOLEUM                          | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          |              | 4                    | TRANSITE SHINGLE SIDING           | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 705          | UNDER BL     | 1                    | WATER LINE INSULATION             | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          |              | 10                   | STEAM LINE INSULATION             | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          |              | 13                   | FLOOR TILE - 12 X 12              | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          |              | 14                   | LINOLEUM                          | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          | KITCHEN      | 4                    | TRANSITE PANEL - WALLS            | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          | BOILER RM    | 11                   | STEAM LINE JOINT INSULATION       | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          | BOILER RM    | 15                   | HOT WATER TANK INSULATION         | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          |              | 4                    | TRANSITE SHINGLE SIDING           | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          | OUTSIDE      | 10                   | STEAM LINE INSULATION             | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 708          | OUTSIDE      | 11                   | STEAM LINE JOINT INSULATION       | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 719          |              | 13                   | FLOOR TILE - 12 X 12              | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 719          |              | 4                    | TRANSITE SHINGLE SIDING           | DAMAGE                           | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 719          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 719          | UNDER BL     | 1                    | WATER LINE INSULATION             | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 719          | UNDER BL     | 7                    | WATER LINE JOINT INSULATION       | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 730          |              | 5                    | TAR SHINGLE ROOF                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |



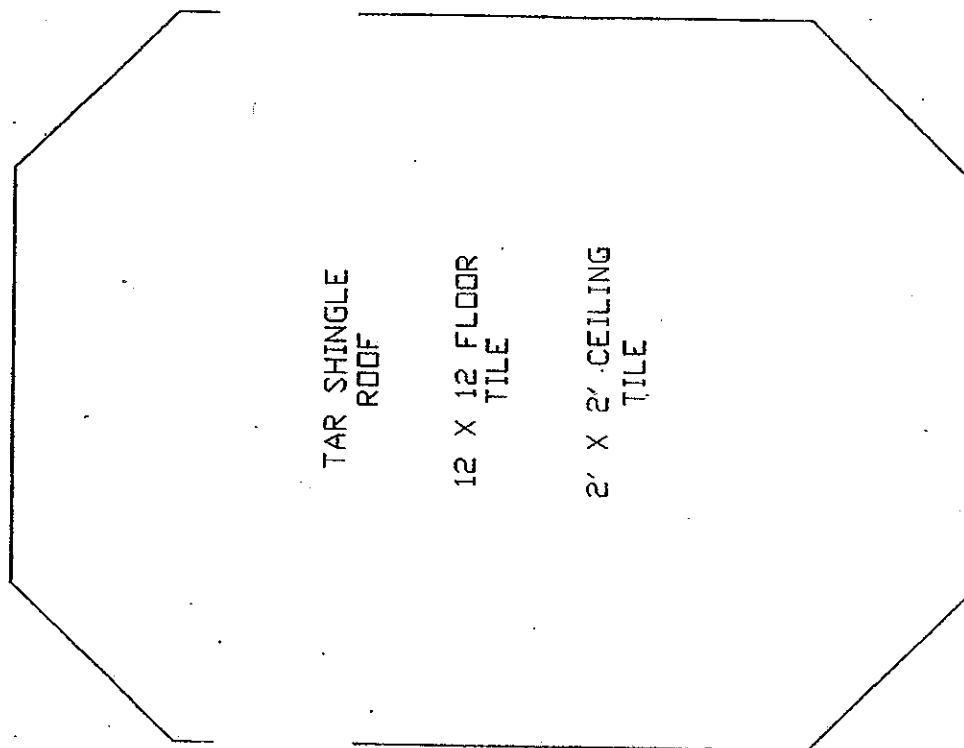


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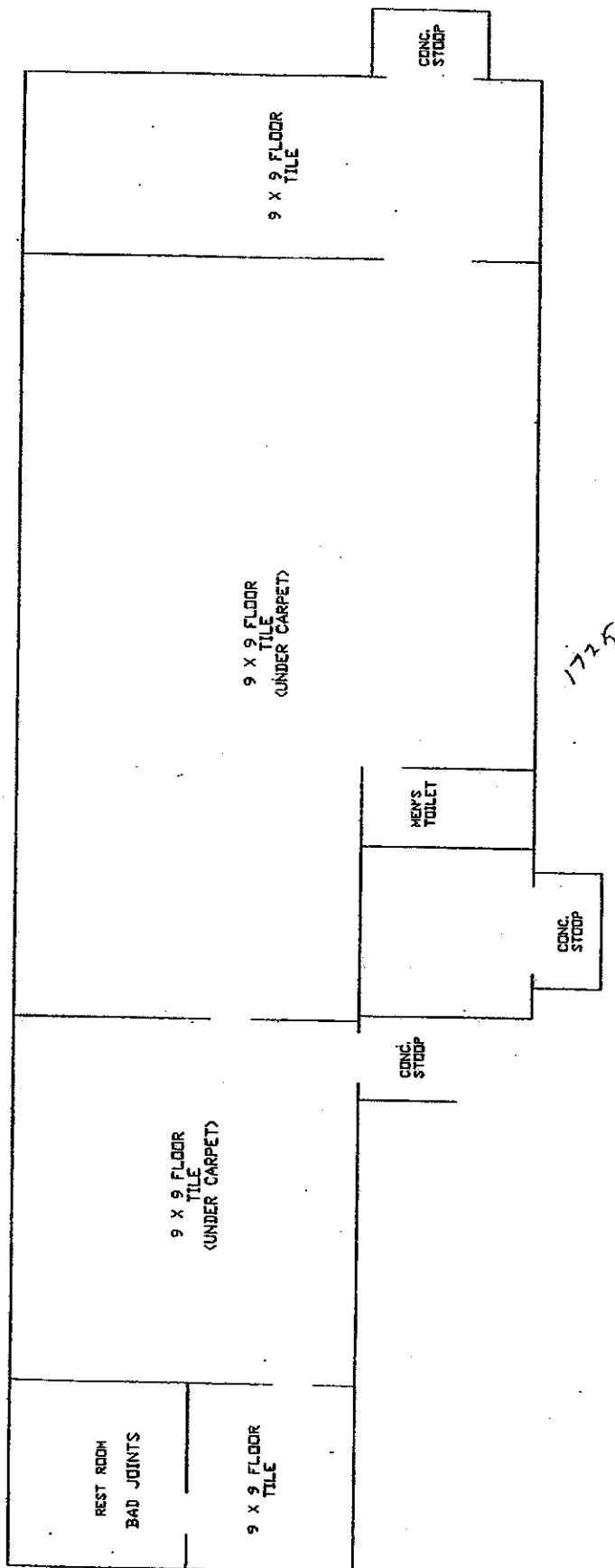
ADMINISTRATION AREA BLDG 703-D ADP BUILDING  
SCALE 1/8" = 1'-0"

032398



ADMINISTRATION AREA BLDG 720-C SENTRY STATION  
SCALE: 1/4" = 1'-0"

032399



ADMINISTRATION AREA BLDG 702 TELEPHONE EXCHANGE  
SCALE 1/8" = 1'-0"

**ASBESTOS CONTAINING BUILDING MATERIALS  
SURVEY REPORT**

**BUILDINGS: 35-M and 39-M**



## ASBESTOS SURVEY

LHAAP

DATE: JANUARY 13, 1985

FORM A

(BUILDING SUMMARY REPORT)

PAGE: 1 OF 3

| BLDG NO. | BLDG NAME          | AREA | DATE<br>INSP'D | INSP'D<br>BY | SURVEY FINDINGS (BUILDING CONTAINS) |                                           |                                    |                                          | NO ASBESTOS<br>EXCLUSIONARY<br>STATEMENT<br>(NA) |
|----------|--------------------|------|----------------|--------------|-------------------------------------|-------------------------------------------|------------------------------------|------------------------------------------|--------------------------------------------------|
|          |                    |      |                |              | VERIFIED<br>FRIABLE<br>ACBM<br>(VF) | VERIFIED<br>NON-FRIABLE<br>ACBM<br>(VN-F) | ASSUMED<br>FRIABLE<br>ACBM<br>(AF) | ASSUMED<br>NON-FRIABLE<br>ACBM<br>(AN-F) |                                                  |
| ✓ 707-A  | CHANGE HOUSE       | 800  | 11 OCT 84      | TPJ          | VF                                  |                                           | AF                                 | AN-F                                     |                                                  |
| 821-A    | LOADING DOCK       | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    |                                          | NA                                               |
| ✓ 707-B  | CHANGE HOUSE       | 800  | 11 OCT 84      | TPJ          | VF                                  |                                           | AF                                 | AN-F                                     |                                                  |
| 707-C    | WAREHOUSE          | 800  | 11 OCT 84      | TPJ          | VF                                  |                                           | AF                                 | AN-F                                     |                                                  |
| 801-F    | WASHOUT BUILDING   | 800  | 02 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| ✓ 33-M   | MAGAZINE           | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| ✓ 35-M   | MAGAZINE           | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| ✓ 39-M   | MAGAZINE           | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| ✓ 810    | WAREHOUSE          | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    |                                          | NA                                               |
| 811-1    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-2    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-3    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-4    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-5    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-6    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-7    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-8    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-9    | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-10   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-11   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-12   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-13   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-14   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-15   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-16   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-17   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-18   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-19   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-20   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-21   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-22   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-23   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |
| 811-24   | RICHMOND MAGAZINES | 800  | 03 NOV 84      | TPJ          |                                     |                                           |                                    | AN-F                                     |                                                  |

ASBESTOS SURVEY  
LHAAP

DATE: JANUARY 13, 1994

FORM C  
(HOMOGENOUS AREA REPORT)  
800 AND MAGAZINE AREAS

| BLDG NO. | ROOM/BAY NO. | HOMO AREA NO. | HOMOGENOUS AREA NAME OR DESCRIPTION | CLASSIFICATION SURFACING MAT'L THERM SYS INSUL MISC. MAT'L (SM/TSI/MM) | SIZE AREA SQUARE FEET/ LINEAR FEET (SF/LF) | FRIABLE NON-FRIABLE (F/NF) | ASBESTOS KNOWN/ ASSUMED/ NONE (K/A/N) |
|----------|--------------|---------------|-------------------------------------|------------------------------------------------------------------------|--------------------------------------------|----------------------------|---------------------------------------|
| 707-A    |              | 4             | TRANSITE SHINGLE SIDING             | MM                                                                     | 4,500 SF +/-                               | NF                         | A                                     |
| 707-A    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 4,000 SF +/-                               | NF                         | A                                     |
| 707-A    | SHOWER RM    | 4             | TRANSITE PANEL - WALL               | MM                                                                     | 575 SF +/-                                 | NF                         | A                                     |
| 707-A    |              | 10            | STEAM LINE INSULATION               | TSI                                                                    | 10 SF +/-                                  | NF                         | A                                     |
| 707-A    |              | 11            | STEAM LINE INSULATION               | TSI                                                                    | 10 SF +/-                                  | NF                         | A                                     |
| 707-A    | HEATER RM    | 4             | TRANSITE PANEL - WALL               | MM                                                                     | 675 SF +/-                                 | NF                         | A                                     |
| 707-B    |              | 4             | TRANSITE SHINGLE SIDING             | MM                                                                     | 4,500 SF +/-                               | NF                         | A                                     |
| 707-B    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 4,000 SF +/-                               | NF                         | A                                     |
| 707-C    |              | 4             | TRANSITE SHINGLE SIDING             | MM                                                                     | 5,000 SF +/-                               | NF                         | A                                     |
| 707-C    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 3,700 SF +/-                               | NF                         | A                                     |
| 801-F    |              | 3             | CORR TRANSITE SIDING                | MM                                                                     | 8,000 SF +/-                               | NF                         | A                                     |
| 33-M     |              | 3             | CORR TRANSITE SIDING                | MM                                                                     | 3,000 SF +/-                               | NF                         | A                                     |
| 33-M     |              | 3             | CORR TRANSITE - ROOF                | MM                                                                     | 5,000 SF +/-                               | NF                         | A                                     |
| 35-M     |              | 3             | CORR TRANSITE SIDING                | MM                                                                     | 3,000 SF +/-                               | NF                         | A                                     |
| 35-M     |              | 3             | CORR TRANSITE - ROOF                | MM                                                                     | 5,000 SF +/-                               | NF                         | A                                     |
| 39-M     |              | 3             | CORR TRANSITE SIDING                | MM                                                                     | 3,000 SF +/-                               | NF                         | A                                     |
| 39-M     |              | 3             | CORR TRANSITE - ROOF                | MM                                                                     | 5,000 SF +/-                               | NF                         | A                                     |
| 811-1    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 811-1    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-1    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-2    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 811-2    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-2    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-3    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 811-3    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-3    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-4    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 811-4    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-4    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-5    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 811-5    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-5    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-6    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-6    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-6    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-6    |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-7    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-7    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-7    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-7    |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-8    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-8    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-8    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-8    |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-9    |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-9    |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-9    |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-9    |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-10   |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-10   |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-10   |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-10   |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-11   |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-11   |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |
| 811-11   |              | 74            | TAR COAT- CONC BLK                  | TSI                                                                    | 1,700 SF +/-                               | NF                         | A                                     |
| 811-11   |              | 4             | TRANSITE PNL DOOR                   | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 811-12   |              | 4             | TRANSITE SHINGLES                   | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 811-12   |              | 5             | TAR SHINGLE ROOF                    | MM                                                                     | 2,200 SF +/-                               | NF                         | A                                     |

SHADING AND ITALICS INDICATE ACM REMOVED



## PHYSICAL ASSESSMENT

150

CORRUGATED TRANSITE SIDING

**THOMAS P. JONES**

NOVEMBER 3, 1994

39-15180-APR-1

# FORM

**INDEX**

39-15180-APR-1

[illegible]

1. % DAMAGED  
% Scattered or % Localized

## 2. EXTENT OF DAMAGE

#### 1. TYPE OF DAMAGE:

**4. FREQUENCY OF CONTACT:**  
**High**

A. Service workers work in this vicinity of the material more than once per week or  
B. The material is in a public area and accessible to building occupants.  
(e.g. hallway, corridor, auditorium)

A. Service workers work in the vicinity of the material once per month to once per week.

**Low**

### 5. INFLUENCE OF VIBRATION:

A. Loud motors or engines present  
e.g. some fan rooms) or  
B. Intrusive noises or easily sensed vibrations  
(e.g. major airport, major highway)

### Moderate

**You need engines present but not  
Motors or engines present but not**

ou 1nd 2 p p r q i a t t a p ( 3 ) a i n t n z o o

B. Occasional loud sounds (e.g. muscle room)

**Low/None:**

None of the above

#### 4.6. POTENTIAL FOR AIR EROSIONS:

# हिम्

High velocity air (e.g. elevator shaft fan room)

Notable movement of air (e.g. air shaft), ventilator

3

Low/None

**SMOKE WITH NO TROUBLE!**

## 7. ACCESSIBILITY

1 - Within reach / locked  
2 - Within reach / not easily accessible  
3 - Within reach / easily accessible

### & ACTIVITY:

- 0 - Locked mechanical rooms
- 1 - Keyed closets used during shift work
- 2 - Private offices and restrooms
- 3 - Hallways, lounges, wards, and other

## 2. AIR MOVEMENTS

0 - None  
1 - Low  
2 - Moderate  
3 - High

**10. FRIABILITY:**

- 0- Mechanical assault to damage  
(e.g. striking with hammer, etc.)
- 1- Physical assault to damage  
(e.g. kicking the material)
- 2- Damage by hand touch  
(e.g. hands rubbing on material)
- 3- Damaged by air movement  
(e.g. survival on fireproofing, etc.)

## 11. MULTIPLE SHIFT RANKING:

1 - Open 8 hours per day  
2 - Open 8-16 hours per day  
3 - Open 16-24 hours per day

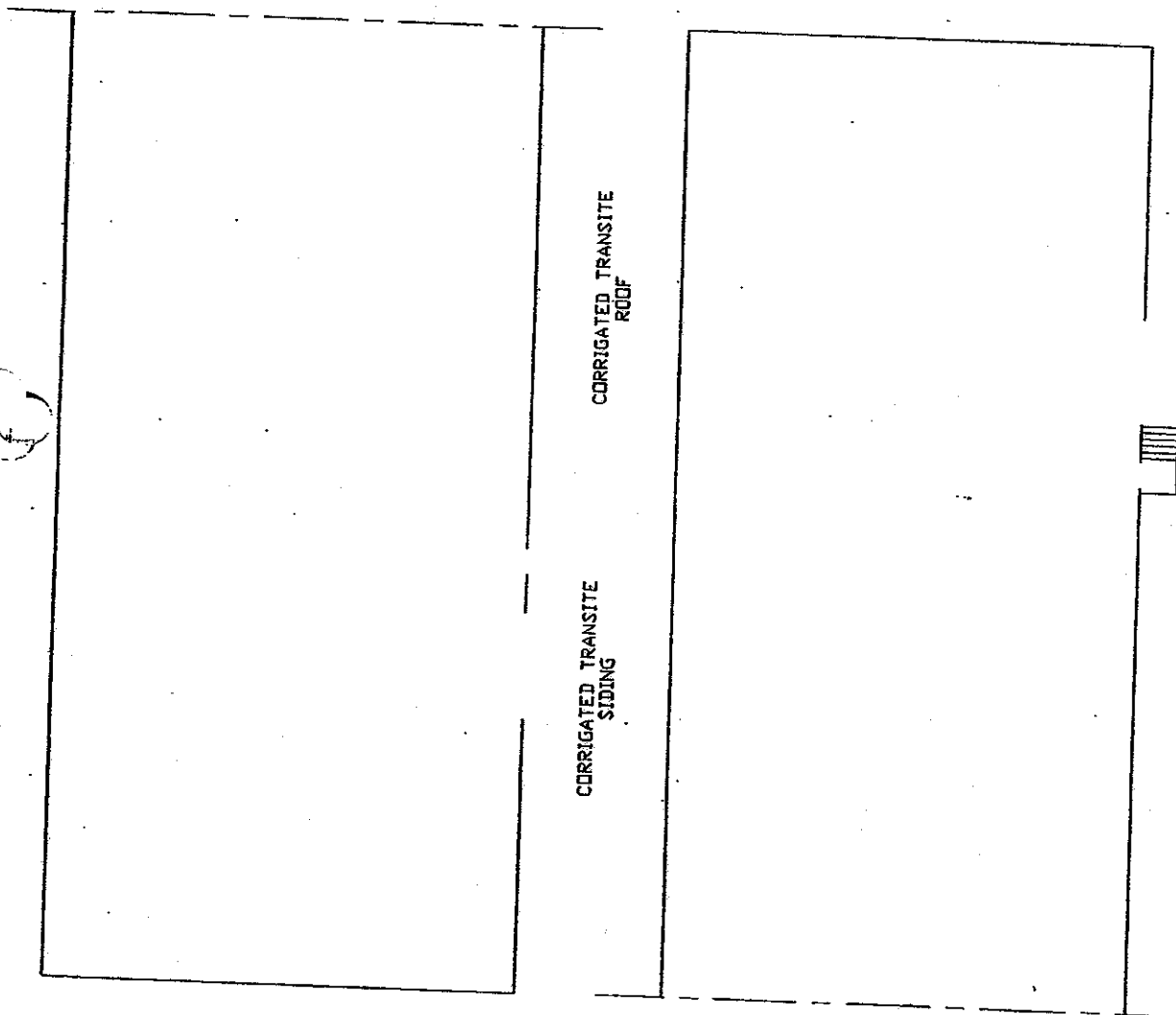
**12. ESTIMATED AMOUNT OF MATERIAL**  
(Square Ft. or Linear Ft.)

**13. SUBSTRATE:**

**B - Boiler**  
**C - Concrete**  
**D - Ductwork**  
**SR - Sheet Rock**  
**P - Plaster**  
**PF - Pipes Fittings**  
**PS - Pipes (Straight)**  
**SB - Steel Beams**  
**SM - Sheet Metal**  
**T - Tank**  
**W - Wood**  
**WM - Wire Mesh**

032404

| BUILDING NO. | ROOM/BAY NO. | HOMOGENOUS AREA NO. | HOMOGENOUS AREA NAME/DESCRIPTION       | HAZARD ASSESSMENT CLASSIFICATION | HAZARD RANKING | REASON F/ CLASSIFICATION | INSPECTOR'S NAME (SIGNATURE F/ MASTER COPY ONLY) | DATE     |
|--------------|--------------|---------------------|----------------------------------------|----------------------------------|----------------|--------------------------|--------------------------------------------------|----------|
| 707-A        |              | 4                   | TRANSITE SHINGLE SIDING                | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        | SHOWER R     | 4                   | TRANSITE PANEL - WALLS                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        |              | 10                  | STEAM LINE INSULATION - METAL ENCASED  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        |              | 11                  | STEAM LINE JOINT INSULATION - METAL EN | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        | HEATER R     | 4                   | TRANSITE PANEL - WALLS                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-A        |              | 9                   | HOT WATER TANK                         | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-B        |              | 4                   | TRANSITE SHINGLE SIDING                | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-B        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-B        | SHOWER R     | 4                   | TRANSITE PANEL - WALLS                 | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-B        | HEATER R     | 7                   | WATER LINE JOINT INSULATION            | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-B        |              | 7                   | WATER LINE JOINT INSULATION            | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-C        |              | 4                   | TRANSITE SHINGLE SIDING                | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-C        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-C        | SHOWER R     | 4                   | TRANSITE PANEL - WALLS                 | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 707-C        |              | 1                   | WATER LINE INSULATION                  | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
|              |              | 17                  | BOILER INSULATION                      | SIGNIFICANT DAMAGE               | 7              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 801-F        |              | 3                   | CORRUGATED TRANSITE SIDING             | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 801-F        |              | 4                   | TRANSITE PANEL - WALLS                 | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 33-M         |              | 3                   | CORRUGATED TRANSITE SIDING             | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 33-M         |              | 3                   | CORRUGATED TRANSITE SIDING - ROOF      | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 35-M         |              | 3                   | CORRUGATED TRANSITE SIDING             | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 35-M         |              | 3                   | CORRUGATED TRANSITE SIDING - ROOF      | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 39-M         |              | 3                   | CORRUGATED TRANSITE SIDING             | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 39-M         |              | 3                   | CORRUGATED TRANSITE SIDING - ROOF      | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-1        |              | 4                   | TRANSITE SHINGLES - FRONT & EAVES      | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-1        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-1        |              | 74                  | TAR COATING ON CONCRETE BLOCK SIDES    | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-2        |              | 4                   | TRANSITE SHINGLES - FRONT & EAVES      | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-2        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-2        |              | 74                  | TAR COATING ON CONCRETE BLOCK SIDES    | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-3        |              | 4                   | TRANSITE SHINGLES - FRONT & EAVES      | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
| 811-3        |              | 5                   | TAR SHINGLE ROOF                       | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |
|              |              | 74                  | TAR COATING ON CONCRETE BLOCK SIDES    | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/09/95 |



NO SUSPECT MATERIAL  
INSIDE BLDG

AREA 800 BLDG 35-M MAGAZINE  
SCALE 1/20" = 1'-0"



032407

CORRIGATED TRANSITE  
ROOF

CORRIGATED TRANSITE  
SIDING

NO SUSPECT MATERIAL  
INSIDE BLDG

AREA 800 BLDG 39-M MAGAZINE  
SCALE 1/2" = 1'-0"

**ASBESTOS CONTAINING BUILDING MATERIALS  
SURVEY REPORT**

**BUILDING: 4-Y**

[illegible]

ASBESTOS SURVEY  
LONGHORN AAP

## FORM C

## (HOMOGENOUS AREA REPORT)

DATE: JANUARY 13, 1995 Y AREA, STATIC TEST, SIGNAL TEST, &amp; BURNING GROUNDS

| BLDG. NO. | ROOM/BAY NO. | HOMO. AREA NO. | HOMOGENOUS AREA NAME OR DESCRIPTION   | CLASSIFICATION SURFACING MAT'L THERM SYS INSUL MISC. MAT'L (SM/TSI/MM) | SIZE AREA SQUARE FEET/ LINEAR FEET (SF/LF) | FRIABLE NON-FRIABLE (F/NF) | ASBESTOS KNOWN/ ASSUMED/ NONE (K/A/N) |
|-----------|--------------|----------------|---------------------------------------|------------------------------------------------------------------------|--------------------------------------------|----------------------------|---------------------------------------|
| 8-T       |              | 4              | TRANSITE PNL-CEILING                  | MM                                                                     | 3,800 SF +/-                               | NF                         | A                                     |
| 8-T       |              | 4              | TRANSITE PNL-CEILING                  | MM                                                                     | 3,800 SF +/-                               | NF                         | A                                     |
| 8-T       |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 2,500 SF +/-                               | NF                         | A                                     |
| 8-T       |              | 5              | TAR SHINGLE ROOF                      | MM                                                                     | 3,800 SF +/-                               | NF                         | A                                     |
| 8-T-2     |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 350 SF +/-                                 | NF                         | A                                     |
| 13-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 2,000 SF +/-                               | NF                         | A                                     |
| 16-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 3,000 SF +/-                               | NF                         | A                                     |
| 16-T      |              | 4              | TRANSITE PANEL - CEILING AND WALLS    | MM                                                                     | 2,000 SF +/-                               | NF                         | A                                     |
| 16-T      |              | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 30 LF +/-                                  | F                          | A                                     |
| 16-T      | OUTSIDE      | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 50 LF +/-                                  | F                          | K                                     |
| 16-T      | OUTSIDE      | 11             | STEAM LINE INSULATION                 | TSI                                                                    | 10 LF +/-                                  | F                          | K                                     |
| 16-T-1    |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 350 SF +/-                                 | NF                         | A                                     |
| 16-T-1    |              | 1              | WATER LINE INSULATION                 | TSI                                                                    | 25 LF +/-                                  | F                          | A                                     |
| 16-T-1    |              | 4              | TRANSITE PANEL - WALL                 | MM                                                                     | 250 SF +/-                                 | NF                         | A                                     |
| 20-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 4,650 SF +/-                               | NF                         | A                                     |
| 20-T      |              | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 100 LF +/-                                 | F                          | A                                     |
| 20-T-1    |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 300 SF +/-                                 | NF                         | A                                     |
| 20-T-1    |              | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 10 LF +/-                                  | F                          | A                                     |
| 21-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 350 SF +/-                                 | NF                         | A                                     |
| 21-T      |              | 3              | CORR TRANSITE - ROOF                  | MM                                                                     | 150 SF +/-                                 | NF                         | A                                     |
| 23-T      |              | 1              | WATER LINE INSULATION                 | TSI                                                                    | 200 LF +/-                                 | F                          | A                                     |
| 23-T      |              | 18             | STEAM LINE INSULATION - METAL JACKET  | TSI                                                                    | 50 LF +/-                                  | F                          | N                                     |
| 23-T      | MACHINERY    | 19             | STEAM LINE INSULATION - METAL JACKET  | TSI                                                                    | 10 LF +/-                                  | F                          | N                                     |
| 23-T      |              | 20             | STEAM LINE INSULATION                 | TSI                                                                    | 500 LF +/-                                 | F                          | K                                     |
| 23-T      |              | 21             | STEAM LINE JOINT INSUL                | TSI                                                                    | 100 LF +/-                                 | F                          | K                                     |
| 23-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 2,900 SF +/-                               | NF                         | A                                     |
| 25-T      |              | 14             | LINOLEUM                              | MM                                                                     | 3,500 SF +/-                               | NF                         | A                                     |
| 25-T      |              | 22             | CEILING TILE                          | MM                                                                     | 3,500 SF +/-                               | NF                         | N                                     |
| 25-T      | MECH RM      | 1              | WATER LINE INSULATION                 | TSI                                                                    | 50 LF +/-                                  | F                          | A                                     |
| 25-T      | WALKWAY      | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 700 SF +/-                                 | NF                         | A                                     |
| 31-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 2,300 SF +/-                               | NF                         | A                                     |
| 31-T      |              | 3              | CORR TRANSITE - ROOF                  | MM                                                                     | 3,600 SF +/-                               | NF                         | A                                     |
| 34-T      |              | 1              | WATER LINE INSULATION                 | TSI                                                                    | 40 LF +/-                                  | F                          | A                                     |
| 34-T      | OUTSIDE      | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 8 LF +/-                                   | F                          | A                                     |
| 34-T-1    |              | 4              | TRANSITE PANEL - WALL                 | MM                                                                     | 225 SF +/-                                 | NF                         | K                                     |
| 34-T-1    |              | 10             | STEAM LINE INSULATION                 | TSI                                                                    | 45 LF +/-                                  | F                          | A                                     |
| 34-T-1    |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 450 SF +/-                                 | NF                         | A                                     |
| 35-T      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 3,200 SF +/-                               | NF                         | A                                     |
| 39-T      | MECH RM      | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 200 SF +/-                                 | NF                         | A                                     |
| 39-T-1    |              | 4              | TRANSITE PANEL - WALL                 | MM                                                                     | 175 SF +/-                                 | NF                         | A                                     |
| 20-X      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 600 SF +/-                                 | NF                         | A                                     |
| 20-X      |              | 3              | CORR TRANSITE - ROOF                  | MM                                                                     | 400 SF +/-                                 | NF                         | A                                     |
| 22-X-1    |              | 14             | LINOLEUM                              | MM                                                                     | 80 SF +/-                                  | NF                         | A                                     |
| 22-X-1    |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 280 SF +/-                                 | NF                         | A                                     |
| 3-Y       |              | 4              | TRANSITE PANEL - BOXES & CRAWL SPACE  | MM                                                                     | 250 SF +/-                                 | NF                         | A                                     |
| 4-Y       |              | 4              | TRANSITE PNL-CEILING                  | MM                                                                     | 2,000 SF +/-                               | NF                         | A                                     |
| 4-Y       | OUTSIDE      | 10             | STEAM LINE INSULATION - METAL JACKET  | TSI                                                                    | 80 LF +/-                                  | F                          | K                                     |
| 4-Y       | OUTSIDE      | 11             | STEAM LINE JOINT INSUL - METAL JACKET | TSI                                                                    | 9 LF +/-                                   | F                          | K                                     |
| 4-Y-2     |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 350 SF +/-                                 | NF                         | A                                     |
| 13-Y      |              | 3              | CORR TRANSITE SIDING                  | MM                                                                     | 700 SF +/-                                 | NF                         | A                                     |
| 13-Y      | BLOWERS      | 11             | STEAM LINE JOINT INSUL                | TSI                                                                    | 6 LF +/-                                   | F                          | A                                     |

SHADING AND ITALICS INDICATE ACM REMOVED

ASBESTOS SURVEY  
LONGHORN AAP  
DATE: JANUARY 13, 1995

FORM D  
(SAMPLING LOG AND RESULTS)

PAGE 1 OF 1

| BLDG. # | HA # | SAMPLE NO. | SAMPLE LOCATION<br>PHYSICAL DESCRIPTION  | MANNER<br>USED TO<br>DETERMINE<br>SAMPLE<br>LOCATION | SAMPLE<br>INSPECTOR<br>(SIGNATURE F/<br>MASTER COPY<br>ONLY) | SAMPLE<br>DATE | ANALYSIS<br>LABORATORY<br>NAME | ANALYSIS<br>DATE | ANALYSIS RESULTS<br>(COPIES OF ANALYSIS<br>REPORTS ATTACHED) |
|---------|------|------------|------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|----------------|--------------------------------|------------------|--------------------------------------------------------------|
| 4Y      | 1    | 1          | 1/2" WATER LINE - PAPER                  | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 4Y      | 7    | 1          | 1/2" WATER LINE JOINT                    | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 4Y      | 10   | 1          | 2" STEAM LINE - OUTSIDE                  | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 4Y      | 11   | 1          | 2" STEAM JOINT - OUTSIDE                 | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 23T     | 18   | 1          | 2" STEAM LINE (OVERHEAD)                 | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 23T     | 19   | 1          | 1" STEAM LINE (ON MACHINERY)             | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 23T     | 20   | 1          | 4" STEAM LINE (BLACK LAVA LIKE MATERIAL) | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 23T     | 21   | 1          | 4" STEAM LINE (BLACK LAVA LIKE MATERIAL) | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 25T     | 22   | 1          | 12" X 12" WHITE CEILING TILE             | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | NEGATIVE                                                     |
| 10      | 10   | 1          | 2" STEAM LINE - OUTSIDE                  | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 36T2    | 10   | 1          | 1" STEAM LINE                            | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 36T3    | 11   | 1          | 1" STEAM JOINT                           | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 16T     | 10   | 2          | 2" STEAM LINE - OUTSIDE                  | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 16T     | 11   | 2          | 2" STEAM JOINT - OUTSIDE                 | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 45Y     | 10   | 1          | 1" STEAM LINE                            | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 18Y     | 10   | 2          | 1" STEAM LINE                            | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 18Y*    | 10   | 2          | 1" STEAM LINE                            | RANDOM                                               | TPJ                                                          | 10/11/94       | EEG                            | 10/24/94         | POSITIVE                                                     |
| 18Y     | 11   | 1          | 1" STEAM JOINT                           | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 16Y     | 11   | 2          | 1" STEAM JOINT                           | RANDOM                                               | TPJ                                                          | 10/12/94       | ARI                            | 10/28/94         | POSITIVE                                                     |
| 16Y*    | 11   | 2          | 1" STEAM JOINT                           | RANDOM                                               | TPJ                                                          | 10/11/94       | EEG                            | 10/24/94         | POSITIVE                                                     |

\* - DUPLICATE SAMPLE

# PHYSICAL ASSESSMENT FORM

STATE CERTIFICATION NO. 150

INSPECTOR'S SIGNATURE: THOMAS P. JONES

DATE: OCTOBER 12, 1994

HA-1 WATER LINE INSULATION  
HA-7 WATER LINE JOINT INSULATION  
HA-4 TRANSITE PANEL - CEILING  
HA-4 TRANSITE PANEL - WALLS  
HA-10 STREAM LINE INSULATION W/ METAL JACKET - OUTSIDE  
HA-11 STREAM LINE JOINT INSULATION W/ METAL JACKET - OUTSIDE

HA-1 WATER LINE INSULATION  
HA-7 WATER LINE JOINT INSULATION  
HA-4 TRANSITE PANEL - CEILING  
HA-4 TRANSITE PANEL - WALLS  
HA-10 STREAM LINE INSULATION W/ METAL JACKET - OUTSIDE  
HA-11 STREAM LINE JOINT INSULATION W/ METAL JACKET - OUTSIDE

HA-1 WATER LINE INSULATION  
HA-7 WATER LINE JOINT INSULATION  
HA-4 TRANSITE PANEL - CEILING  
HA-4 TRANSITE PANEL - WALLS  
HA-10 STREAM LINE INSULATION W/ METAL JACKET - OUTSIDE  
HA-11 STREAM LINE JOINT INSULATION W/ METAL JACKET - OUTSIDE

BUILDING NO.: 4-Y (Y AREA)  
ROOM NO.:

FORM E  
(INPUT)

## FUNCTIONAL AREA TYPE; CHECK ONE

Auditorium AU  
Boiler Room BR  
Cafeteria CA  
Class CH  
Class Room CR  
Crawl Space CS  
Dormitory DO  
X Entire Building EB

Gymnasium GY  
Hallway HA  
Laboratory LA  
Lobby LB  
Library LE  
Lounge LO  
Locker Rm LR  
Mechanical Rm MR

Office OF  
Outside OS  
Roof RP  
Restroom RR  
Shower Room SR  
Storage Area SA  
Sub Ceiling SC  
Shop SH

Kitchen KT  
Other

| Support Material | 1. % of Damage | 2. Extent Of | 3. Type Of | 4. Freq. of Contact | 5. Influence of Vibration | 6. Potential for Air Erosion | 7. Accessibility | 8. Activity | 9. Ventilation | 10. Feasibility | 11. Multiple Shift Rerouting | 12. Extent Amount of Material | 13. Substrate | For O.C.R. Use Only Percentages |
|------------------|----------------|--------------|------------|---------------------|---------------------------|------------------------------|------------------|-------------|----------------|-----------------|------------------------------|-------------------------------|---------------|---------------------------------|
| HA-1             | 25% +/-        | D            | D          | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 2              | 1               | NA                           | 95 LF +/-                     | PS            |                                 |
| HA-7             | 0% +/-         | NA           | NA         | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 2              | 1               | NA                           | 8 LF +/-                      | PF            |                                 |
| HA-4             | 0% +/-         | NA           | NA         | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 2              | 0               | NA                           | 2,000 SF +/-                  | SR            |                                 |
| HA-4             | 25% +/-        | D            | P          | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 2              | 0               | NA                           | 5,500 SF +/-                  | SR            |                                 |
| HA-10            | 3% +/-         | D            | D          | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 3              | 1               | NA                           | 80 LF +/-                     | PS            |                                 |
| HA-11            | 1% +/-         | D            | D          | LOW-A               | LOW/NONE                  | LOW/NONE                     | 3                | NA          | 3              | 1               | NA                           | 9 LF +/-                      | PP            |                                 |

1. % DAMAGED  
% Seattered or % Localized

1. EXTENT OF DAMAGE  
- Localized, D-Distributed

1. TYPE OF DAMAGE:  
D-Destruction, W-Wear, P-Physical

1. FREQUENCY OF CONTACT:  
High

A. Service workers work in the vicinity of the material more than once per week or  
B. The material is in a public area and accessible to building occupants.  
(e.g. hallway, corridor, auditorium)

A. Service workers work in the vicinity of the material once per month to once per week or  
B. The material is in a room or office and is accessible to the occupants.

Low  
A. Service workers work in the vicinity of the material less than once per week or  
B. The material is visible but not within the reach of the building occupants.

5. INFLUENCE OF VIBRATION:  
High:

A. Loud motors or engines present  
e.g. some fan rooms) or  
B. Intrusive noises or easily sensed vibrations (e.g. car for airport, major highway)

Moderate

A. Motors or engines present but not obtrusive (e.g. elevators vibrating but no fan in the area) or  
B. Occasional loud sounds (e.g. music room).

Low/None

Note of the above

6. POTENTIAL FOR AIR EROSIONS:  
High:

High velocity air (e.g. elevator shaft, fan room)

Moderate  
Noticeable movement of air (e.g. air shaft, ventilator air stream)

Low/None

Note of the above

7. ACCESSIBILITY

0 - Not accessible / beyond reach  
1 - Within reach / locked  
2 - Within reach / not easily accessible  
3 - Within reach / easily accessible

8. ACTIVITY:

0 - Locked mechanical rooms  
1 - Keyed closets used during shift work  
2 - Private offices and restrooms  
3 - Hallways, lounges, waiters, and other such areas

9. AIR MOVEMENT:

0 - None  
1 - Low  
2 - Moderate  
3 - High

10. FRIABILITY:

0 - Mechanical assault to damage (e.g. striking with hammer, etc.)  
1 - Physical assault to damage (e.g. kicking the material)  
2 - Damage by hand touch (e.g. hands rubbing on material)  
3 - Damaged by air movement (e.g. sprayed on fireproofing, etc.)

11. MULTIPLE SHIFT RANKING:

1 - Open 8 hours per day  
2 - Open 8-16 hours per day  
3 - Open 16-24 hours per day

12. ESTIMATED AMOUNT OF MATERIAL:  
(Square Ft. or Linear Ft.)

13. SUBSTRATE:

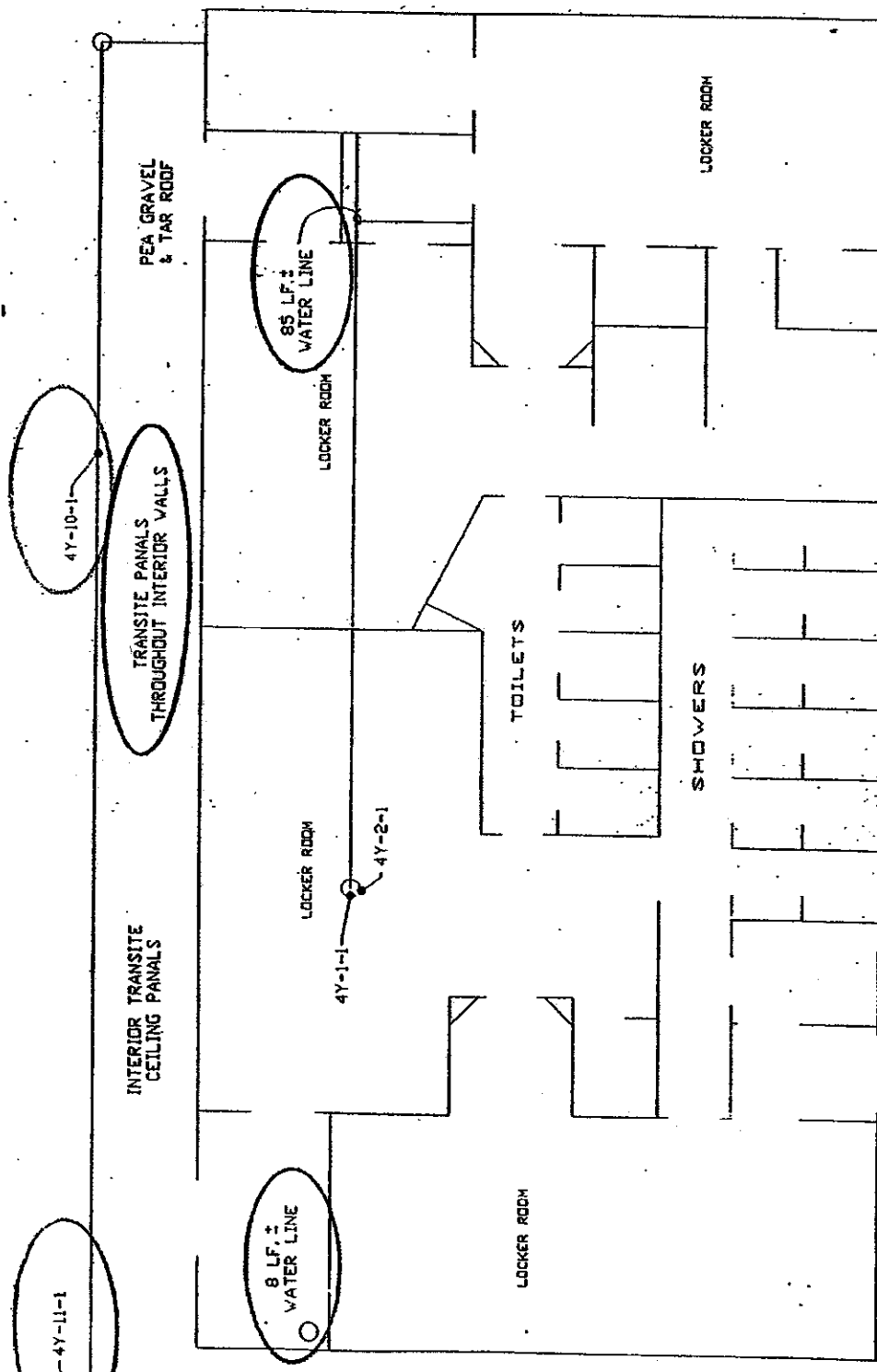
B - Bolter  
C - Concrete  
D - Ductwork  
SR - Sheet Rock  
P - Plaster  
PS - Pipe (Straight)  
SB - Steel Beams  
SM - Sheet Metal  
T - Tank  
W - Wood  
WM - Wire Mesh

032412



032413

| BUILDING NO. | ROOM/BAY NO. | HOMOGENEOUS AREA NO. | HOMOGENEOUS AREA NAME/DESCRIPTION       | HAZARD ASSESSMENT CLASSIFICATION | HAZARD RANKING | REASON F/ CLASSIFICATION | INSPECTOR'S NAME (SIGNATURE F/ MASTER COPY ONLY) | DATE     |
|--------------|--------------|----------------------|-----------------------------------------|----------------------------------|----------------|--------------------------|--------------------------------------------------|----------|
| 34-T-1       |              | 4                    | TRANSITE PANEL - WALLS                  | GOOD                             | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 34-T-1       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 34-T-1       |              | 3                    | CORRUGATED TRANSITE SIDING              | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 35-T         |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-1       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-2       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-3       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-3       |              | 11                   | STEAM LINE JOINT INSULATION             | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-4       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T         | MECH RM      | 3                    | CORRUGATED TRANSITE SIDING              | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 36-T-1       |              | 4                    | TRANSITE PANEL - WALLS                  | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 20-X         |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 20-X         |              | 3                    | CORRUGATED TRANSITE SIDING - ROOF       | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 22-X-1       |              | 14                   | UNOLEUM                                 | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 22-X-1       |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 3-Y          |              | 4                    | TRANSITE PANEL - BOXES AROUND CRAWL     | GOOD                             | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
|              |              | 13                   | FLOOR TILE - 9 X 9                      | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          |              | 1                    | WATER LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          |              | 7                    | WATER LINE JOINT INSULATION             | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          |              | 4                    | TRANSITE PANEL - CEILING                | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          |              | 4                    | TRANSITE PANEL - WALLS                  | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          | OUTSIDE      | 10                   | STEAM LINE INSULATION - METAL JACKET    | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y          | OUTSIDE      | 11                   | STEAM LINE JOINT INSULATION - METAL JAC | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 4-Y-2        |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 13-Y         |              | 3                    | CORRUGATED TRANSITE SIDING              | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 13-Y         |              | 11                   | STEAM LINE JOINT INSULATION - BLOWERS   | GOOD                             | 1              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y         |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y         |              | 11                   | STEAM LINE JOINT INSULATION             | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y         |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y-1       |              | 4                    | TRANSITE PANEL - WALLS                  | GOOD                             | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y-1       |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y-1       |              | 14                   | UNOLEUM                                 | GOOD                             | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y-1       |              | 3                    | CORRUGATED TRANSITE SIDING              | DAMAGED                          | 4              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |
| 16-Y         |              | 10                   | STEAM LINE INSULATION                   | DAMAGED                          | 5              | EPA DECISION TREE        | ANDREW TUNNELL                                   | 01/01/95 |



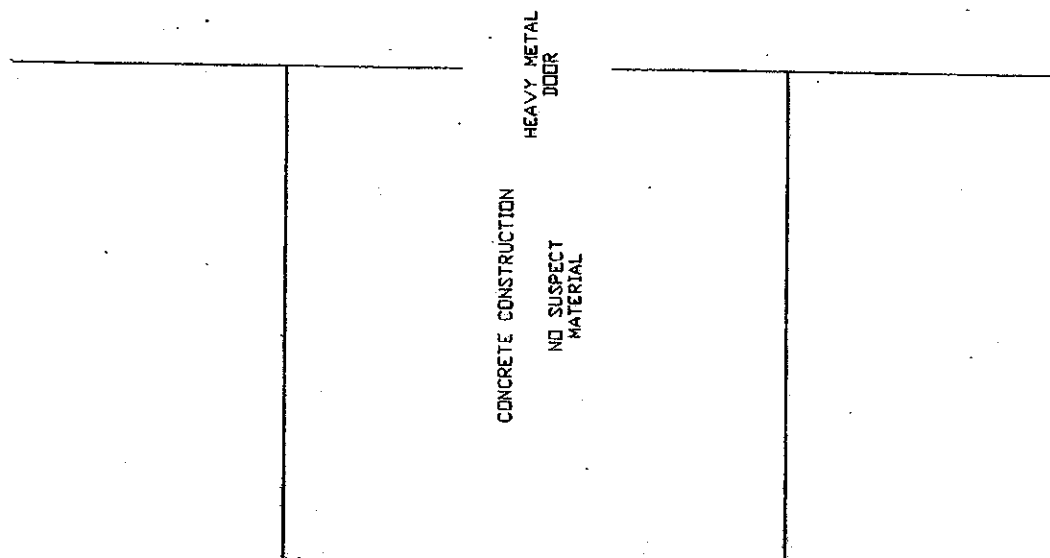
AREA Y BLDG 4-Y CHANGE HOUSE  
SCAD 1/8" = 1'-0"

**BUILDINGS WITH NO PRESUMED ACM  
SURVEY REPORT**

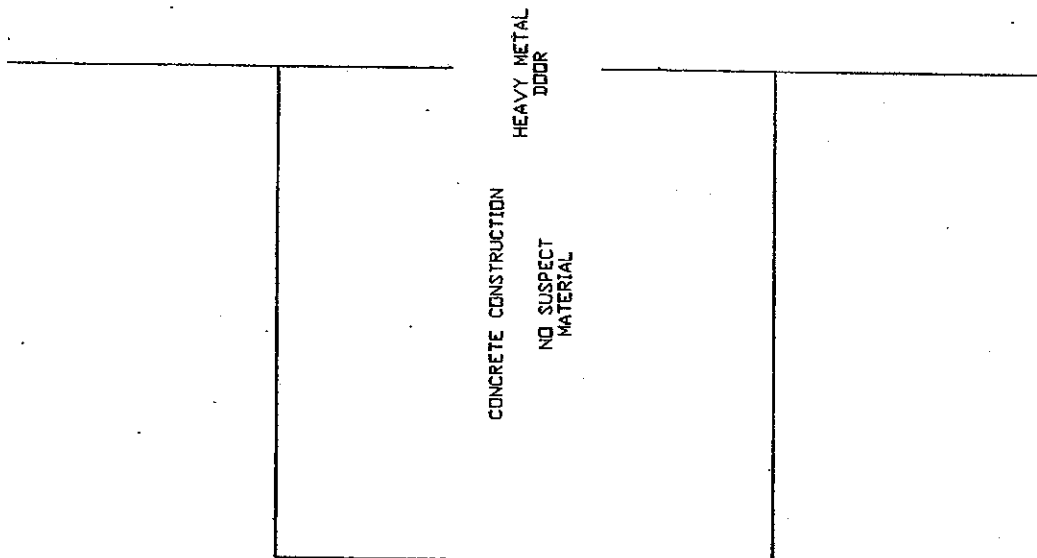
**BUILDINGS:    BST-2 and BST-4**

[illegible]

032417



AREA 800 BLDG BST-2 STORAGE IGLOO  
SCALE 1/8" = 1'-0"



AREA 800 BLDG BST-4 STORAGE IGLOO  
SCALE 1/8" = 1'-0"



032419

**BUILDINGS WITH NO PRESUMED ACM  
SURVEY REPORT**

**BUILDING: 31-M**

## GENERAL PURPOSE MAGAZINES

31-M

Friable Asbestos: No  
Sump: No  
Condensate Discharges: No  
Comments: Good chance for explosive contamination

21-T

Friable Asbestos: No  
Sump: No  
Condensate Discharges: No  
Comments: Good chance for explosive contamination

48-Y

Friable Asbestos: No  
Sump: No  
Condensate Discharges: No  
Comments: Good chance for explosive contamination

***Attachment 6***

***Response to Comments by USEPA and USFWS***

**RESPONSE TO COMMENTS**  
**BY U.S. ENVIRONMENTAL PROTECTION AGENCY REGION VI**  
**DRAFT ENVIRONMENTAL CONDITION OF PROPERTY I (ECOP)**  
**LONGHORN ARMY AMMUNITION PLANT**  
**KARNACK, TEXAS**

**Comment 1:** Section 3.1, Environmental Condition of Property Categories, Category 1, Page 2: Category 1 areas are defined in this document as "*Areas where no release or disposal of hazardous substance or petroleum products has occurred (including no migration of these substances from adjacent areas).*" Included under Category 1 are two Magazine Group Installations (Buildings 31-M and 35-M). This area was included in a study conducted by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) which is documented in the *Hazardous and Medical Waste Study No: 37-EF-5506-00 Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant Karnack, Texas 10-12 July 2000*. The study referred to the area with Buildings 31-M and 35-M as the Warehouse Area. The Warehouse Area was defined as follows:

This area consisted of three warehouse buildings near the North side of the plant used in the past to store finished 4.2 inch and 155 mm illumination rounds.

The study documented that soil sampling from this area found several metals and SVOCs. Nine of the metals in the surface sample population exceeded the PCLs or background concentrations in one or more samples. These metals were antimony, arsenic, cadmium, calcium, iron, lead, magnesium, potassium, and strontium. Pentachlorophenol, one of the SVOC compounds detected in several of the samples, exceeded the Industrial/Commercial PCL.

The study concluded that the Warehouse Area should be added to the DSERTS Database at LHAAP as a new site. The study also recommended that the Warehouse Area site should be added to the restoration program at LHAAP.

Has any additional studies been conducted in the Warehouse Area?  
 If so, what were the findings?  
 How do the study's findings compare to the recently completed background work?

If no additional studies were conducted, this area will need to be reclassified as a Category 7 site (i.e., Area that requires additional evaluation).

**Response:** Concur.

The U.S. Fish and Wildlife Service performed additional soil sampling at the Warehouse Area during April and May 2002. Three soil samples were obtained and analyzed for metals, semi-volatile organic compounds (SVOCs), organochlorine pesticides, total polychlorinated biphenyls (PCBs) and perchlorate. One of the three samples was also analyzed for dioxin/furan

analysis. The investigation is documented in the *U.S. Fish and Wildlife Service, Region 2, Contaminants Investigation of Western Portion of Caddo Lake National Wildlife Refuge, Texas, Project ID No. 94420-02-Y037, prepared by Arlington Ecological Services Field Office, December 2002*. This document will be added to the ECOP Attachment 1, References.

The suitability to transfer the Warehouse Area will be re-evaluated prior to property transfer and findings will be presented and coordinated with both the U.S. EPA Region 6 and U.S. Fish and Wildlife Service. Figures 2 and 3 will be revised to include clarification that the Warehouse Area property will not be included in the initial transfer to the U.S. Fish and Wildlife Service (USFWS). Table 1 will be revised to specify that Buildings 31-M and 35-M will not be included in the initial transfer to the USFWS. Table 3 will be revised to include the Warehouse Area and will specify that the site is currently undergoing further consideration of the appropriate environmental condition of property. Also, Section 9.0 will be updated: it will specify that based on U.S. EPA Region 6 comments (with reference to an Attachment), the Warehouse Area will not be included in the initial transfer to the USFWS.

**Comment 2:** Section 3.1, Environmental Condition of Property Categories, Category 3, Page 2: Category 3 areas are defined in this document as "*Areas where release, disposal, and or migration of hazardous substance has occurred, but at concentrations that do not require a removal or remedial response.*" Included under Category 3 is Site 45. Site 45 is described as follows:

Site 45 (Magazine Area) was used for storage of munitions. The total area is over 800 acres; within this area are 58 bunkers, 3 magazine buildings in the northwest corner, and 2 buildings. Each bunker consists of three concrete walls and a concrete-floored structure 26x60x10 feet, with a wooden roof and doors. Operated from 1942 until 1995.

Surface soil samples in the Magazine Area were previously collected by USACHPPM. USACHPPM's efforts are documented in the *Hazardous and Medical Waste Study No: 37-EF-5506-00 Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant Karnack, Texas 10-12 July 2000*. The U.S. Fish and Wildlife Service (USFWS) also collected surficial soil samples in the Magazine Area. The USFWS's efforts are documented in the *Contaminants Investigation of Northern, Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas* (November 2003).

Provided recently for EPA's review was an *Evaluation of Surface Soil Analytical Data from LHAAP-45* (Shaw Environmental, Inc., April 2004). This evaluation was limited to twelve of the Magazine Area surface soil samples collected by USFWS. The soil sampling data were evaluated with respect to background, human health, and ecological soil screening values. These comparisons were made to determine whether further investigative or remedial action is necessary at this site.

To assist in EPA's evaluation of the Magazine Area, all data from the two sample collection efforts noted above need to be evaluated with respect to

background, human health, and ecological soil screening values. As was discussed during our conference call on April 15, 2004, please conduct this evaluation and provide the results for EPA's review

Response:

Concur.

The U.S. Army will evaluate all data collected in the Magazine Area during the two sampling collection efforts as discussed during the April 15, 2004 telephone conference call. The ECOP will be revised to reflect that LHAAP-45 will not be included in the initial property transfer. Table 3 will be revised to specify that the site is currently undergoing further consideration of the appropriate environmental condition of property. Also, Section 9.0 will be updated: it will specify that based on U.S. EPA Region 6 comments (referenced in an Attachment), LHAAP-45 will not be included in the initial transfer to USFWS. Figures 2 and 3 will also be revised to indicate that LHAAP-45 will not be included in the initial transfer to the USFWS. It will also be noted that since LHAAP-52 and LHAAP-70 are located within the LHAAP-45 site boundary, LHAAP-52 and LHAAP-70 also will not be included in the initial transfer to the USFWS.

**Comment 3:** Attachment 2, Environmental Protection Provisions, Notice of the Potential for the Presence of Munitions and Explosives Concern, and Covenant, page 6: Text states, *"In the event that USFWS, its successors, or assign should discover any MEC, on the property, it shall not attempt to remove or destroy it, but shall notify the local police or local fire authorities and designated explosive ordnance personnel will be contacted and promptly dispatched to address MEC safety concerns."*

#### Comments/Questions

- Do the local police or local fire authorities know who to contact to address MEC safety concerns? Who should they contact?
- Who will be responsible for the costs associated with any future MEC response activities?
- DoD has developed extensive requirements aimed at protecting OE workers and the public from explosive hazards. Those working or recreating in or near areas thought to contain UXO should be taught what to do and what not to do in the event of an encounter with UXO, including who they should notify. For example, the Navy EOD Technology Division has developed instructions for the public and site personnel to follow in the event of an encounter with UXO, as described in the text box below.



### Instructions for Responding to and Reporting UXO Hazards

1. After identifying the potential presence of UXO, do not move any closer to it. Some types of ordnance have magnetic or motion-sensitive proximity fuses that may detonate when they sense a target. Others may have self-destruct timers built in.
2. Do not transmit any radio frequencies in the vicinity of a suspected UXO hazard. Signals transmitted from items such as walkie-talkies, short-wave radios, citizen band (CB) radios, cellular phone, or other communication or navigation devices may detonate the UXO.
3. Do not attempt to remove any object on, attached to, or near a UXO. Some fuses are motion-sensitive, and the UXO may explode.
4. Do not move or disturb a UXO hazard site with a standard UXO marker or with other suitable materials, such as ground engineer's tape, colored cloth, or colored ribbon. Attach the marker no closer than the point where you first recognized the UXO hazard.
5. Leave the UXO hazard area.
6. Report the UXO to the proper authorities.
7. Stay away from areas of known or suspected UXO. This is the best way to prevent accidental injury or death.

**REMEMBER: "IF YOU DID NOT DROP IT, DO NOT PICK IT UP!"**

Response:

Concur.

- (a) The Harrison County Sheriff's Department will be the point of contact. An alternate contact is the City of Marshall Fire Department. They will then promptly contact the U.S. Army's 705<sup>th</sup> Explosives Ordnance Detachment (EOD) at Fort Polk, LA. and they will promptly be dispatched at the Army's expense to address MEC safety concerns.
- (b) The Army will be responsible for costs associated with individual EOD response actions as part of the EOD mission. Future MEC response actions required as a result of past Army site activities will be the responsibility of the Army.
- (c) The Army will provide information to inform the public and recreation workers on what to do if UXO is encountered. However, the language developed by the Navy EOD Technology Center, as presented by the U.S. EPA Region 6 comment, may be too complicated for the intended audience. The Army will provide information and instructions specifically intended for the anticipated audience, i.e. the average citizen. Proposed language will be coordinated with the U.S. Fish and Wildlife.
- (d) Recognition training will be provided to the U.S. Fish and Wildlife Service and others who may encounter UXO. Training is tentatively scheduled the first week of June 2004.

**Comment 4:** Typographic Errors, Attachment 2 Environmental Protection Provisions, Notice of the Presence of Lead-Based Paint and Covenant Against the Use of the Property for Residential Purposes, Paragraph a., Page 4: Text states, "...'*Residential Real Property*' means...available for use but the residents..."

*Revise text "...'*Residential Real Property*' means...available for use by the residents..."*

Response: Concur. The text will be revised to reflect the comment.

**Comment 5:** Notice of the Potential for the Presence of Munitions and Explosives Concern, and Covenant, page 6: Text states, "...*none of the buildings or land proposed for transfer is known or suspected to contain munitions and explosive or concern (MEC).*"

*Revise text "...none of the buildings or land proposed for transfer is known or suspected to contain munitions and explosive of concern (MEC)."*

Response: Concur. The text will be revised to reflect the comment.

**RESPONSE TO COMMENTS  
BY U.S. FISH AND WILDLIFE SERVICE  
DRAFT ENVIRONMENTAL CONDITION OF PROPERTY I (ECOP)  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS**

*Specific Comments*

**Comment 1:** Section 2.0, Property Description: The text states "The Property proposed for transfer consists of approximately 5935 acres of land with 15 facilities as summarized in Table 1 and shown on Figure 2."

Will the final version indicate the exact number of acres to be included in the initial transfer? Also, Building 4-Y no longer exists and should be removed from Table 1 and Figure 2 and anywhere else that it is mentioned in the document; and the number should be reduced to 14.

**Response:** Concur.

The exact number of acres for the initial transfer to the USFWS is 5031.75 acres and will be included in the final ECOP document. It will also be noted in Section 3.1 that Warehouse Area and the Magazine Areas will not be included in the initial transfer to the USFWS. Building 4-Y will be removed from Table 1 and Figure 2 and the text will be revised to reflect the comment. Also, based on EPA Region 6 comments, transfer of LHAAP-45 (Magazine Area) and the Warehouse Area property will not be included in the initial transfer to the USFWS. It will also be noted in Table 1 and Figure 2, that Buildings 31-M and 35-M (associated with the Warehouse Area) will be not be included in the initial transfer to the USFWS.

The text in Section 2.0, last sentence will be revised as follows: "The Property proposed for transfer consists of approximately 5,935 acres of land with 14 facilities (however, the initial transfer to the USFWS consists of 5031.75 acres and 12 facilities) as summarized in Table 1 and shown on Figure 2.

**Comment 2:** Section 3.0, Environmental Condition of Property Categories: Category 1: Please remove listing for Change Facility (Building 4-Y)

**Response:** Concur. Change facility (Building 4-Y) will be removed from the text.

**Comment 3:** Section 8.0, Archaeological Properties: The text states "The property proposed for transfer contains three known archaeological sites (41HS240, 41HS408, and 41HS484) that are eligible for inclusion in the National Register of Historic Places."

The map presented during the Transition Management Group Meeting on February 4, 2004, dated January 29, 2004, lists numerous additional sites that are not mentioned in the report or noted on Figure 6. Many of these sites are noted as "localities". The LHAAP Cultural Resources Management Plan (CRMP) by Geo-Marine Inc., December 1996 indicates that 41HS408 is not an eligible site, while 41HS407 is eligible.

It is difficult to determine the total number of sites identified the way the text in this section is written. Are there 16 total sites or 32 total sites? Please clarify.

There are numerous other discrepancies between the ECOP and the CRMP and no mention of any information from *Archaeological Surveys of 319 Hectares at the Longhorn Army Ammunition Plant, Harrison County, Texas, June 1998*. This document should also be included in the list of references in Attachment I.

Response:

Concur.

The documents referenced in the comment were reviewed to resolve the apparent discrepancies. The ECOP will be revised and include an accurate list of archeological sites requiring incorporation into the Final ECOP, including sites that are either eligible, potentially eligible, or an undetermined status. The map presented during the Transition Manager's Group Meeting on February 4, 2004, dated January 29, 2004, listed numerous additional sites. However, it is important to note that the listing was based on all sites that were surveyed, regardless of status. Sites that are ineligible will not be included in the ECOP. Based on a review of all available documentation, 27 archeological sites have been identified and will be incorporated into the Final ECOP. These include the following sites: 41HS (prefix for all sites) - 240, 241, 385, 404, 406, 407, 408, 409, 436, 484, 485, 539, 754, 755, 808, 809, 810, 811, 812, 813, 815, 816, 817, 818, 819, 820, and 821. The Environmental Protection Provisions, Notice of Archeological Property and Preservation Covenant (Attachment 2), will be revised to include all 27 archeological sites. The ECOP will also specify there are 24 archivally identified sites as documented in the *Cultural Resources Management Plan* (GeoMarine, 1996). Attachment 1, References will be updated to include *Archaeological Surveys of 319 Hectares at the Longhorn Army Ammunition Plant, Harrison County, Texas, June 1998*.

Although the 1996 LHAAP Cultural Resources Management Plan (CRMP) classified archeological site 41HS408 as ineligible, a subsequent archeological survey classified 41HS408 as "undetermined" justifying protection pending further investigation (reference Pertulla, Timothy K. and Bo Nelson, 1999).

Section 8.0 will be revised as follows:

"The Property proposed for transfer contains three known archeological sites (41HS240, 41HS484, and 41HS407) that are eligible for inclusion into the National Register of Historic Places (NRHP). Twenty-four other archeological sites have been listed as either potentially eligible or undetermined category and therefore justify protection pending further investigation. A total of twenty-seven (27) archeological sites have been determined to possess the necessary attributes to make them eligible for protection or inclusion into the NRHP. Archeological sites were classified based on documentation contained in three reports referenced in Attachment 1 as follows: (1) Geo-Marine, 1996; (2) Gaddus, Freeman and Fields, 1998; and (3) Pertulla and Nelson, 1999. Additionally, the

Cultural Resources Management Plan (GeoMarine, 1996) stated that twenty-four archivally identified sites were on the LHAAP installation.

The USFWS will honor its responsibilities under the National Historic Preservation Act and will coordinate all activities in furtherance of its responsibilities with the Texas State Historic Preservation Office, appropriate federally recognized tribes, and other interested parties. The letter of transfer will include the archeological properties covenant and notice provided in the Environmental Protection Provisions (**Attachment 2**).

It should also be noted that the ECOP will be revised to delete Figure 6 depicting the location of archeological sites. This revision is required as it is standard practice not to have the identification and location of protected sites in the same document (i.e. for security purposes).

**Comment 4: Table 1 7: Facilities: Table 1 7 should be amended to indicate that building 31-M contains asbestos.**

Response:

Concur. Table 7, Summary of Asbestos-Containing Materials Building Survey, will be amended to indicate Building 31-M contains asbestos.

**Comment 5: Table 3: Environmental Sites:**

**Site 57 (Rubble Burial LHAAP):** The Installation Action Plan (IAP) document cited is a document that indicates the present status of all known sites at the facility and does not contain site assessment results. Please cite the document(s) that shows the preliminary site assessment results that indicate there was no evidence of a release.

Response:

Concur. The Final DERPMS/RMIS Resolution Document dated June 1995 includes the contaminant assessment for the Rubble Burial, LHAAP-57 and is the basis for no further investigation. The document will be referenced in the text, Table 3, and Attachment 1.

**Site 70 (Loading Dock Magazine Areas):** The IAP document cited is a document that indicates the present status of all known sites at the facility and does not contain site assessment results. Please cite the document(s) that shows the preliminary site assessment results that indicate there was no evidence of a release.

Response:

Concur. The Site Investigation – Preliminary Scope of Investigations, Group 5 Sites Report dated February 1995 includes investigation results for the Loading Dock Magazine Area, LHAAP-70. The decision for no further investigation was also documented in the Final Work Plan for the Preliminary Assessment Site Investigations, Group No. 5 Sites at Longhorn, Army Ammunition Plant, September 1995. These documents will be referenced in the text, Table 3, and Attachment 1.

**Site 71 (Oil Spill at Building 813):** The IAP document cited is a document that indicates the present status of all known sites at the facility and does not

**contain site assessment results. Please cite the document(s) that shows the preliminary site assessment results that indicate there was no evidence of a release.**

**Response:** Concur. The Site Investigation – Preliminary Scope of Investigations, Group 5 Sites Report dated February 1995 includes investigation results for the Oil Spill at building 813, LHAAP-71. The decision for no further investigation was also documented in the Final Work Plan for the Preliminary Assessment Site Investigations, Group No. 5 Sites at Longhorn, Army Ammunition Plant, September 1995. These documents will be referenced in the text, Table 3, and Attachment 1.

**Comment 6: Attachment 2: Environmental Protection Provisions: Notice of the Presence of Asbestos-Containing Materials and Covenant:**

**Section A: Table 6 should be Table 1.**

**Response:** Concur. The text will be revised to reflect the appropriate Table 7 (Summary of Asbestos Containing Materials Building Survey).

**Section E: Last sentence should be removed.**

**Response:** Exception. The text of the last sentence will be clarified as follows: “The failure of the USFWS to inspect, or to be fully informed as to the condition of all or any portion of the buildings on the Property offered, will not constitute grounds for any claim or demand against the Army

**Comment 7: Notice of the Potential for Presence of Polychlorinated Biphenyls and Covenant:**

**Section B: The text states, “The USFWS agrees to be responsible for any future remediation of PCBs or PCB containing equipment found to be necessary on the Property.”**

**This sentence needs to be removed from the document or clarified to reflect that it is only referring to PCBs associated with Light Ballasts in the buildings on the property that is being transferred. Any possible cleanup of PCBs at Longhorn will continue to be the responsibility of the Army.**

**Response:** Concur. The sentence will be clarified as follows: “The USFWS agrees to be responsible for any necessary future remediation of PCBs associated with Light Ballasts in the buildings on the Property transferred to the USFWS.

**Comment 8: Notice of the Presence of Lead-Based Paint and Covenant Against the Use of the Property for Residential Purposes:**

**Section A. line 6: The word “but” should be replaced with “by” (for use by the residents).  
Section C, Last Sentence: Delete the second “of.”**



**Section D, Last Paragraph, First Sentence:** Suggest the sentence should be rewritten to clarify that the LBP referred to is associated with buildings and equipment on the property and not the property as a whole.

**Response:** Concur. Typographical errors will be corrected in Sections A and C. The first sentence of Section D will be revised as follows: "In complying with these requirements, the Grantee covenants and agrees to be responsible for any abatement or remediation of lead-based paint or lead-based paint hazards on the buildings or adjacent soil covered in this document, found to be necessary as a result of the subsequent use of the Property for residential purposes."

**Comment 9: Notice of Archaeological Property and Preservation Covenant:**

**As noted above, a more accurate detailing of the sites is needed to fully identify all of the archaeological locations on the LHAAP.**

**Response:** Concur. The first sentence of the Notice of Archeological Property and Preservation Covenant will be revised as follows: "In consideration of the conveyance of the real property that includes twenty-seven (27) archaeological properties, 41HS240, 41HS241, 41HS385, 41HS404, 41HS406, 41HS407, 41HS408, 41HS409, 41HS436, 41HS484, 41HS485, 41HS539, 41HS754, 41HS755, 41HS808, 41HS809, 41HS810, 41HS811, 41HS812, 41HS813, 41HS815, 41HS816, 41HS817, 41HS818, 41HS819, 41HS820, and 41HS821, and the twenty-four (24) archivally identified sites, located in the County of Harrison, Texas, the USFWS hereby covenants on behalf of itself, its heirs, successors, and assigns at all times to the Texas State Historic Preservation Officer, to maintain and preserve the twenty-seven archaeological properties.

**END OF DOCUMENT**

LONGHORN ARMY AMMUNITION PLANT,Karnack, Texas*TECHNICAL REVIEW COMMITTEE (TRC) MEETING***AGENDA****DATE:** Wednesday, 2 June 2004**TIME:** 10:30 a.m.**LOCATION:** Army Trailer, GWTP Compound, Longhorn Army Ammunition Plant

|       |                                                                                                 |                       |
|-------|-------------------------------------------------------------------------------------------------|-----------------------|
| 10:30 | WELCOME AND INTRODUCTIONS                                                                       | RMZ                   |
| 10:35 | GWTP Quarterly Report and Geosyntec Update                                                      | BC (CES)              |
| 10:50 | TAPP – Status of Report                                                                         | BJ                    |
| 11:05 | Perchlorate Area Letter Report                                                                  | CM                    |
| 11:15 | Site 12 Feasiblity Report                                                                       | CM                    |
| 11:30 | Site 32 Sampling Approach                                                                       | PS (SHAW)             |
| 11:45 | LUNCH                                                                                           |                       |
| 13:00 | UXO Training                                                                                    | 705 <sup>th</sup> EOD |
| 14:30 | Army Position on Eco Risk Comments                                                              | RZ/JA                 |
| 14:45 | PBC Update                                                                                      | JA (AEC)              |
| 15:00 | Projects Update (Transfer, Demolition, EBS, Perimeter Monitoring, Evaluation of CHPPM/FWS data) |                       |
| 15:10 | Adjourn                                                                                         |                       |

**NOTE:** We will try to finish up before lunch, but will have the option of working through lunch or ordering in to finish before the UXO presentation.

|          |              |
|----------|--------------|
| Location | LHAAP, TX    |
| Date     | June 2, 2004 |

[illegible]



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**Subject: Draft Minutes, Technical Review Committee/Monthly Managers Meeting,  
Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting: Longhorn AAP, Karnack, TX**

**Date of Meeting: June 02, 2004, 10:00 AM – 5:00 PM**

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**Meeting Participants:**

**USAEC:** Jeff Armstrong

**BRAC:** Rose M. Zeiler, Lanis Rieger

**USACE-Tulsa:** Cliff Murray, Ken Kebbell, Susan Trussell

**Shaw:** Praveen Srivastav

**USEPA Region 6:** Chris Villarreal

**TCEQ:** Jim Sher, Kristy Mauricio

**USFWS:** Paul Bruckwicki, Craig Gigglesman, John Stephens, Mark Williams, Jacob Lewis

**DOD-TAPP:** H.L. "Bud" Jones

**CES:** Bill Corrigan

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The meeting was opened by Rose Zeiler with a welcome note to everyone attending. Discussions during the meeting followed the agenda distributed before the meeting. These discussions are summarized below by agenda items.

**Groundwater Treatment Plant Report**

Bill Corrigan of CES presented a report on the groundwater treatment plant performance. Copies of the report were distributed to the participants.

- To a question from Jim Sher, Bill Corrigan replied that DNAPL has not been observed in the influent
- To a question from Chris Villarreal, Bill Corrigan replied that there is an overall downward trend in the TCE concentrations
- A summary of activities by GeoSyntec Consultants was included with the Groundwater Treatment Plant report and was briefly discussed.

**TAPP – Status Report**

Bud Jones presented a summary of his investigations at Longhorn AAP. Copies of the presentation were distributed to the participants.

- To a request from Rose Zeiler, Bud Jones stated that he will provide a copy of the full report soon

### **Perchlorate Area Letter Report**

The perchlorate area letter report is being prepared and will be provided to the team shortly.

### **Site 12 Feasibility Study**

Documentation and implementation of land use controls (LUCs) were discussed at length. Cliff Murray distributed copies of two documents related to this topic: (1) DOD Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions, October 2003; and (2) EPA Guidance on the Resolution of Post-ROD Dispute. A link ([http://www.epa.gov/swerffrr/documents/post\\_rod\\_112503.htm](http://www.epa.gov/swerffrr/documents/post_rod_112503.htm)) to these documents was also forwarded to the team by Rose Zeiler before the meeting. .

Summary of the discussion is as follows:

- Rose Zeiler indicated that according to the DOD guidance, a Remedial Design (RD) document would be the vehicle to spell out details of LUCs at a site.
- The interim remedial action at Site 12 was conducted under a work plan that contained design information and specifications. The Army may prepare an addendum to this work plan to address LUCs.
- Objectives of the LUCs will be stated in the ROD but not the enforceability, which will be addressed in the LUC RD addendum.
- USFWS would like an opportunity to review the LUC RD. The USFWS can conduct those functions of LUC that are consistent with the refuge management, e.g. brush clearance.
- Jim Sher indicated that he has already forwarded copies of the two documents to TCEQ's legal department
- The feasibility study for Site 12 may be finalized with the understanding that LUC issues are being addressed in a separate document (LUC/RD)
- EPA's primary concern with respect to LUCs is enforceability. Chris Villarreal indicated that he might be able to provide examples of how LUCs should be addressed in a ROD.
- TCEQ's primary concern is transfer of control and responsibility

### **Status of Documents**

Praveen Srivastav discussed the status of documents currently in progress or in review. A table showing the status was distributed to the participants.

### **Site 32 Sampling Update**

Rose Zeiler mentioned that the Army is planning soil sampling to define the extent of TNT-contaminated soil. Currently funding issues are being resolved. Some discussion took place on the results of sludge/sediment sampling from one of the buildings prior to its demolition:

- Concentration of mercury in the sample was 7.3 mg/kg
- After sampling, the sediments were removed and disposed offsite at a disposal facility
- Jim Sher stated that soil sampling is required near the building and in the settling pond near the building to demonstrate whether or not there is contamination in these areas
- Shaw will provide additional information to the Army and TCEQ regarding classification of the TNT-contaminated waste soil



### **UXO Awareness Training**

A training session was conducted by military personnel from the 705<sup>th</sup> EOD based at Fort Polk. After the training session, Susan Trussell showed her PowerPoint presentation that she had prepared for visitors to the refuge. There were suggestions that a one page pamphlet be prepared for the visitors on UXO awareness.

### **Army's Position on Ecological Risk Assessment**

A summary of discussions on this subject is as follows:

- With respect to the new set of comments from the EPA and TCEQ on the ecological risk assessment approach, Rose Zeiler stated that the Army may agree with some of the comments but there are some that are candidates for contention. The comments are being looked at and the Army's position will soon be conveyed to the EPA and TCEQ.
- Jim Sher suggested that the Army may want to issue a response to comments and start the 45 day clock for dispute resolution so that issues may be resolved rapidly.

### **PBC Update**

- Jeff Armstrong stated that the earliest a Request for Qualifications may be issued for PBC would be October 2004 and the award may occur by second quarter of FY05
- Jeff Armstrong also mentioned that the AEC would like to include the whole installation under a PBC contract but they understand that PBC may not be the right vehicle for gradual transfer of property to USFWS.
- Rose Zeiler stated that she would like to keep Site 12 and other sites out of the PBC in order to achieve response complete rapidly. Sites 16 and 18/24 are likely candidates for PBC.
- Jim Sher suggested that the Army should try out new technologies at these sites because no one is drinking the water, and thus not urgency for cleanup. Also, these sites would allow a controlled experiment to be performed.

### **Future Meetings**

- The next Monthly Managers Meeting is scheduled to be held at Shaw's Houston office on July 21
- The August 2004 Monthly Managers meeting will be held via conference call on August 11 at 9:00 AM
- The next TRC meeting will be held at Longhorn on September 14

### **Action Items**

- Bud Jones to provide a copy of the full report to Rose Zeiler
- The Army to issue perchlorate letter report
- Shaw to provide information to the Army and TCEQ regarding classification of TNT-contaminated waste soil at Site 32
- The Army to issue an addendum to the IRA work plan to address LUCs at Site 12
- Chris Villarreal to provide examples of how LUCs should be addressed in a ROD

# **Information for Quarterly TRC Meeting**

## **Longhorn Army Ammunition Plant Groundwater Treatment Plant Report**

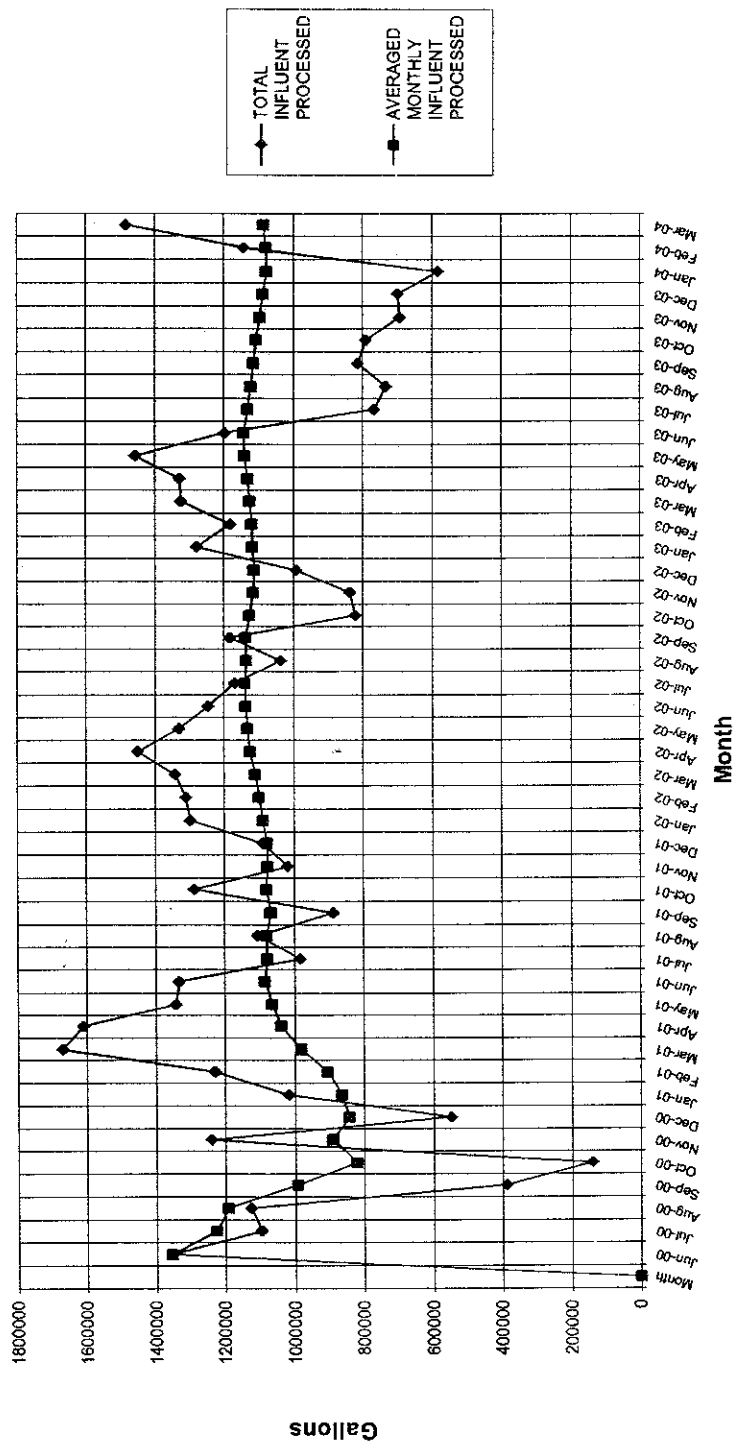
**Site 18/24/16**

**June 2, 2004**



# Water Treated at GWTP (June 2000 – March 2004)

## Longhorn AAP Groundwater Treatment Plant Water Treated June 2000 thru March 2004



# **Site 18/24 Groundwater Production**

**1<sup>st</sup> Quarter 2004**

| <b>ICT #</b>      | <b>January</b> | <b>February</b> | <b>March</b>   | <b>Total</b>     |
|-------------------|----------------|-----------------|----------------|------------------|
| 1                 | 57             | 8,784           | 11,431         | 20,272           |
| 2                 | 454            | 26,109          | 39,955         | 66,518           |
| 3                 | 1,640          | 15,973          | 13,726         | 31,339           |
| 4                 | 13,868         | 20,666          | 25,279         | 59,813           |
| 5                 | 9              | 300             | 9,974          | 10,283           |
| 6                 | 2,623          | 9,826           | 14,622         | 27,071           |
| 7                 | 164            | 2,848           | 3,171          | 6,183            |
| 8                 | 36,665         | 48,650          | 50,119         | 135,434          |
| 9                 | 85,304         | 100,514         | 99,720         | 285,538          |
| 10                | 23,326         | 25,576          | 28,146         | 77,048           |
| 11                | 9,956          | 2,956           | 109,300        | 122,212          |
| 12A               | 6,040          | 34,478          | 28,771         | 69,289           |
| 12B               | 7,720          | 18,444          | 14,284         | 40,448           |
| 12C               | 2,052          | 5,015           | 6,136          | 13,203           |
| 12D               | 17,779         | 17,017          | 31,859         | 66,655           |
| 12E               | 7,942          | 18,632          | 21,853         | 48,427           |
| 13A               | 9,024          | 14,680          | 20,705         | 44,409           |
| 13B               | 26,701         | 46,113          | 57,789         | 130,603          |
| 13C               | 10,048         | 58,224          | 65,693         | 133,965          |
| 13D               | 4,179          | 12,065          | 14,521         | 30,765           |
| 13E               | 1,804          | 5,742           | 6,916          | 14,462           |
| 13F               | 5              | 13              | 1,248          | 1,266            |
| 13G               | 0              | 0               | 0              | 0                |
| 14A               | 8,858          | 27,163          | 29,515         | 65,536           |
| 14B               | 19,453         | 22,736          | 29,034         | 71,223           |
| 14C               | 15,992         | 20,477          | 23,192         | 59,661           |
| 14D               | 15,955         | 24,111          | 20,893         | 60,959           |
| 14E               | 17,392         | 27,671          | 25,545         | 70,608           |
| <b>ICT Totals</b> | <b>345,010</b> | <b>614,783</b>  | <b>803,397</b> | <b>1,763,190</b> |

## Analytical Data for Semi-Aromatic ICT Well Samples for April 2004

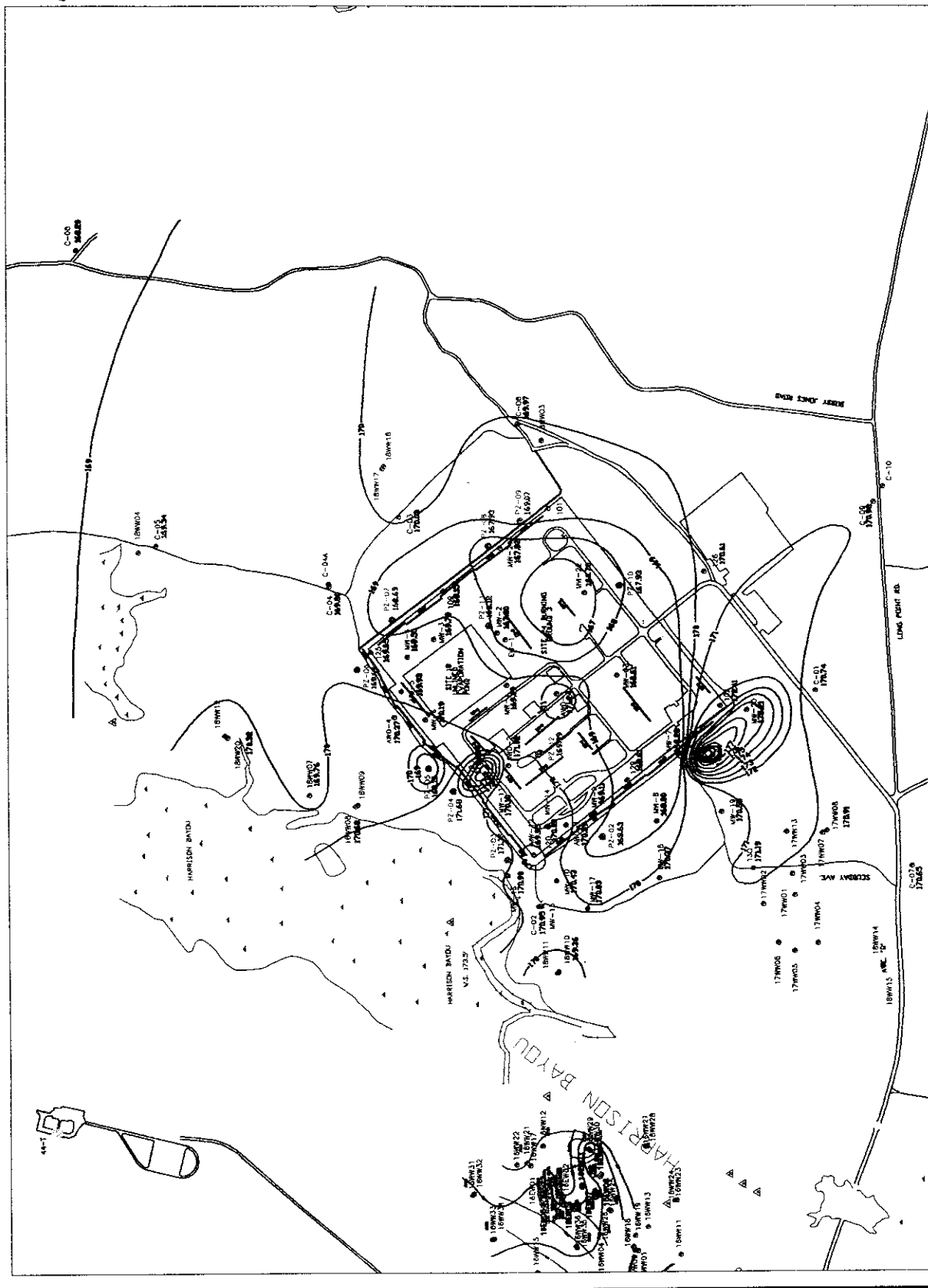
| Volatiles in ug/L      | ICT 1 | ICT 2  | ICT 3  | ICT 4   | ICT 5 | ICT 6 | ICT 6 QC | ICT 6 QA | ICT 7 | ICT 8     | ICT 9   | ICT 10  |
|------------------------|-------|--------|--------|---------|-------|-------|----------|----------|-------|-----------|---------|---------|
| Benzene                | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Carbon Tetrachloride   | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Chloroform             | ND    | ND     | 31.7   | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| cis-1,2-Dichloroethene | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| 1,1-Dichloroethane     | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| 1,2-Dichloroethane     | 74.5  | 96.9   | 1,740  | 441     | 7.34  | ND    | ND       | 16       | ND    | ND        | ND      | ND      |
| 1,1-Dichloroethene     | 18.8  | 13.0   | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Ethylbenzene           | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Methylene Chloride     | ND    | ND     | 65.4   | 405     | ND    | ND    | ND       | ND       | ND    | 1,570,000 | 184,000 | ND      |
| Styrene                | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Tetrachloroethene      | ND    | 5.6    | ND     | ND      | ND    | ND    | ND       | ND       | ND    | 391       | ND      | ND      |
| Toluene                | ND    | ND     | 24.8   | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| 1,1,1-Trichloroethane  | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| 1,1,2-Trichloroethane  | ND    | ND     | 6.59   | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Trichloroethene        | 1,310 | 2,310  | 17,800 | 21,000  | 348   | 276   | 292      | 320      | ND    | 115,000   | 29,400  | 7,920   |
| Vinyl Chloride         | 249   | 10.3   | 3,900  | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Xylenes (total)        | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Acetone                | ND    | ND     | ND     | ND      | ND    | ND    | ND       | ND       | ND    | ND        | ND      | ND      |
| Freon 113              | ND    | 91.70  | 1,070  | 1,590   | 102   | 3,210 | 2,880    | 2,800    | ND    | 108,000   | 48,500  | 2,370   |
| Chloride in mg/L       | ICT 1 | ICT 2  | ICT 3  | ICT 4   | ICT 5 | ICT 6 | ICT 6 QC | ICT 6 QA | ICT 7 | ICT 8     | ICT 9   | ICT 10  |
|                        | 27.8  | 65     | 290    | 233     | 176   | 190   | 131      | 188      | 6.46  | 457       | 1,170   | 291     |
| Perchlorate in ug/L    | ICT 1 | ICT 2  | ICT 3  | ICT 4   | ICT 5 | ICT 6 | ICT 6 QC | ICT 6 QA | ICT 7 | ICT 8     | ICT 9   | ICT 10  |
|                        | 680   | 12,400 | 6,500  | 160,000 | 6,700 | 5,100 | 4,700    | 5,910    | ND    | 10,500    | 17,500  | 117,000 |

Analytical Data for Semi-A. ICT Well Samples for April 2004

| Volatiles in ug/L      | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D | ICT 12E | ICT 13A | ICT 13A QC | ICT 13A QA | ICT 13B | ICT 13C |
|------------------------|--------|---------|---------|---------|---------|---------|---------|------------|------------|---------|---------|
| Benzene                | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| Carbon Tetrachloride   | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| Chloroform             | ND     | ND      | ND      | ND      | 129     | 113     | ND      | ND         | ND         | ND      | ND      |
| cis-1,2-Dichloroethene | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| 1,1-Dichloroethane     | ND     | ND      | ND      | ND      | ND      | 118     | ND      | ND         | ND         | ND      | ND      |
| 1,2-Dichloroethane     | ND     | ND      | ND      | 91.3    | 169     | 115     | 162     | 173        | ND         | 134     | 14.4    |
| 1,1-Dichloroethene     | ND     | ND      | ND      | ND      | 210     | 706     | 110     | 157        | 130        | ND      | ND      |
| Ethylbenzene           | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | 180        | ND      | ND      |
| Methylene Chloride     | ND     | ND      | ND      | ND      | 271,000 | 229,000 | 599     | 808        | ND         | ND      | ND      |
| Styrene                | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| Tetrachloroethene      | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| Toluene                | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | 160        | ND      | ND      |
| 1,1,1-Trichloroethane  | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| 1,1,2-Trichloroethane  | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | 240        | ND      | ND      |
| Trichloroethene        | 5,190  | 3,410   | 11,600  | 4,390   | 108,000 | 112,000 | 22,300  | 27,800     | 23,000     | 2,680   | 433     |
| Vinyl Chloride         | ND     | ND      | ND      | ND      | 857     | 1,240   | ND      | ND         | ND         | 159     | 14.8    |
| Xylenes (total)        | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | 530        | ND      | ND      |
| Acetone                | ND     | ND      | ND      | ND      | ND      | ND      | ND      | ND         | ND         | ND      | ND      |
| Freon 113              | ND     | 92.6    | 341     | 58.1    | 4,820   | 900     | 335     | 488        | 490        | ND      | ND      |
| Chloride in mg/L       | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D | ICT 12E | ICT 13A | ICT 13A QC | ICT 13A QA | ICT 13B | ICT 13C |
|                        | 169    | 165     | 438     | 244     | 389     | 560     | 596     | 549        | 535        | 79.2    | 13.7    |
| Perchlorate in ug/L    | ICT 11 | ICT 12A | ICT 12B | ICT 12C | ICT 12D | ICT 12E | ICT 13A | ICT 13A QC | ICT 13A QA | ICT 13B | ICT 13C |
|                        | 34,300 | 21,300  | 163,000 | 39,600  | 269,000 | 60,000  | 46,400  | 42,800     | 50,200     | 2,750   | ND      |



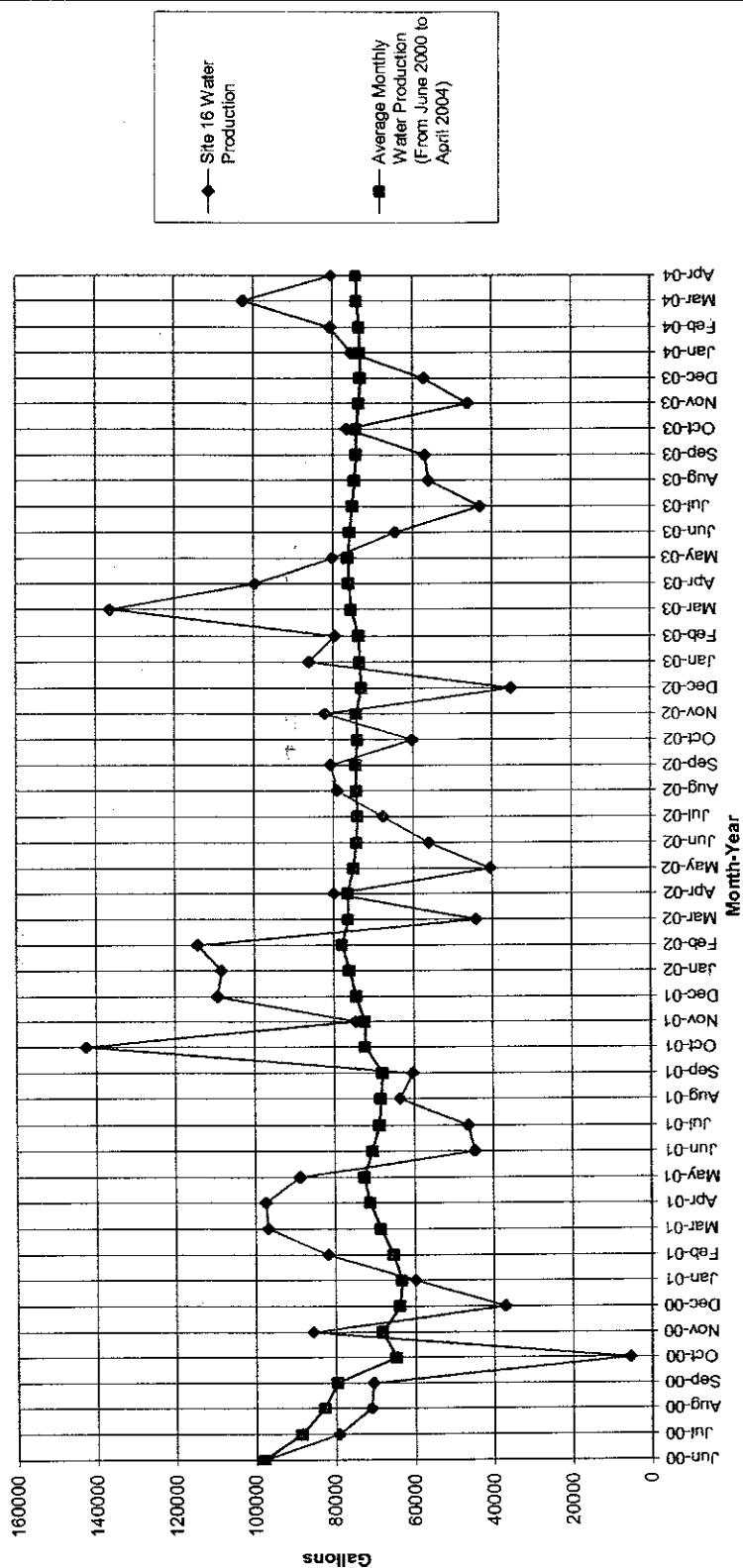
| Volatiles in ug/L      | ICT 13D | ICT 13E | ICT 13F | ICT 13G   | ICT 14A | ICT 14B | ICT 14C | ICT 14D | ICT 14E | ICT 14E QC | ICT 14E QA |
|------------------------|---------|---------|---------|-----------|---------|---------|---------|---------|---------|------------|------------|
| Benzene                | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Carbon Tetrachloride   | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Chloroform             | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| cis-1,2-Dichloroethene | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| 1,1-Dichloroethane     | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| 1,2-Dichloroethane     | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | 303        | 320        |
| 1,1-Dichloroethene     | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Ethylbenzene           | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Methylene Chloride     | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Styrene                | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Tetrachloroethene      | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Toluene                | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| 1,1,1-Trichloroethane  | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| 1,1,2-Trichloroethane  | ND      | ND      | ND      | No Sample | 62.9    | 108     | 1,630   | 9,200   | 18,800  | 15,600     | 16,000     |
| Trichloroethene        | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Vinyl Chloride         | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Xylenes (total)        | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | ND         |
| Acetone                | ND      | ND      | ND      | No Sample | ND      | ND      | ND      | ND      | ND      | ND         | 390        |
| Freon 113              | ND      | ND      | ND      | No Sample | 3,140   | 49.8    | 3,010   | 12,400  | 24,000  | 18,100     | 18,000     |
| Chloride in mg/L       | ICT 13D | ICT 13E | ICT 13F | ICT 13G   | ICT 14A | ICT 14B | ICT 14C | ICT 14D | ICT 14E | ICT 14E QC | ICT 14E QA |
|                        | 56      | 171     | 5.64    | No Sample | 212     | 413     | 702     | 1,550   | 2,840   | 3,010      | 2,900      |
| Perchlorate in ug/L    | ICT 13D | ICT 13E | ICT 13F | ICT 13G   | ICT 14A | ICT 14B | ICT 14C | ICT 14D | ICT 14E | ICT 14E QC | ICT 14E QA |
|                        | 93.9    | 498     | ND      | No Sample | 192,000 | 35,900  | 81,000  | 25,300  | 32,800  | 32,300     | 39,200     |



Complete Environmental Service  
LHAAP Sites 18 & 24  
DATE: Mar. 1, 2004  
Groundwater Levels

032444

## Water Extracted from Site 16 (June 2000 – April 2004)

LONGHORN ARMY AMMUNITION PLANT  
GROUNDWATER TREATMENT PLANT  
SITE 16 WATER PRODUCTION

## Semi-Annual Landfill 16 Data, Sampled April 2004

| Volatiles (ug/L)       | Well 1 | Well 2 | Well 3 | Well 4 | Well 5 | Well 6 | Well 7 | Well 7 QC | Well 7 QA | Well 8 |
|------------------------|--------|--------|--------|--------|--------|--------|--------|-----------|-----------|--------|
| Methylene Chloride     | ND     | ND     | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| Trichloroethene        | 13200  | 77700  | 15800  | 3910   | 5340   | 2190   | 189    | 196       | 160       | 22.5   |
| 1,2-Dichloroethane     | 161    | 68.2   | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| cis-1,2-Dichloroethene | ND     | ND     | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| 1,1-Dichloroethene     | 43.4   | 116    | 39.7   | ND     | ND     | ND     | ND     | ND        | 0.27      | ND     |
| 1,1-Dichloroethane     | ND     | 5.29   | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| 1,1,2-Trichloroethane  | ND     | 20.9   | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| Acetone                | ND     | ND     | ND     | ND     | ND     | ND     | ND     | ND        | 2.6       | ND     |
| Vinyl Chloride         | 132    | 76.5   | ND     | ND     | 129    | ND     | ND     | ND        | ND        | ND     |
| Chloroform             | ND     | 24.4   | ND     | ND     | ND     | ND     | ND     | ND        | ND        | ND     |
| Freon 113              | 13.7   | 138    | 143    | ND     | ND     | 43     | ND     | ND        | 1.6       | ND     |
| Chloride (mg/L)        | 794    | 565    | 478    | 294    | 655    | 768    | 434    | 424       | 454       | 264    |
| P perchlorate (ug/L)   | 760    | 146    | 134    | 72.2   | 1300   | 166    | 27     | 11.6      | ND        | ND     |

**Longhorn Army Ammunition Plant  
Technical Review Committee Meeting  
June 2, 2004  
ESTCP Project Update as of May 31, 2004  
Prepared by GeoSyntec Consultants**

The following is a brief summary of the activities performed by GeoSyntec Consultants (with assistance from Complete Environmental Service) in the past several months for the ESTCP demonstration project to remediate perchlorate and volatile organic compounds using a semi-passive bioremediation system at the Site 16 Landfill.

A tracer test was initiated in February 2004 and was completed at the end of March. The results of the tracer test indicated that a groundwater recirculation time of 3 weeks would be adequate to distribute the electron donor (lactate) across the test area. Electron donor addition began on 25 March and was added every other day directly into the injection points. The electron donor addition period concluded on the 15 April. The pumps were then removed and the system has been operating under normal groundwater flow conditions. Groundwater samples have been collected bi-weekly and are showing reductions in perchlorate concentrations in downgradient monitoring wells.

Bi-weekly monitoring will continue in the interim and the second electron donor addition will likely take place in July.

**Preliminary Geologic/Environmental Report, Plant Production Area, LHAAP**

**By**

**H.L. "Bud" Jones, Ph. D., DoD TAPP Grant Representative**

**Summary and Conclusions**

The following is a summary of the 2003-2004 geologic investigation of the Plant Production Area (PPA), LHAAP, and the environmental implications of the results. Part of the terms of the TAPP Grant called for a study of the geohydrology of the Wilcox Formation at the PPA in order to determine any relationship between subsurface geology and the local contamination of groundwater/surface water.

Prior preliminary subsurface studies in the PPA had suggested the presence of an ancient buried meander loop of the ancestral Goose Prairie Creek. Preliminary work suggested that permeable channel sands located in the meander of the buried ancestral Goose Prairie Creek were in contact locally with buried contaminants in the PPA. The initial study also suggested that contaminated groundwater was localized and perhaps moved along the ancient stream channel to Goose Prairie Creek, where the recent channel possibly eroded downward into the ancient contaminated channel sands. If so, it was theorized that this would result in interaction and contamination of surface waters of Goose Prairie Creek by contaminated groundwater. The results of this study confirm the results of the preliminary studies. The highest concentrations of contaminants consistently occur at the point of incisement shown in this study and decrease up and downstream, probably due to dilution.

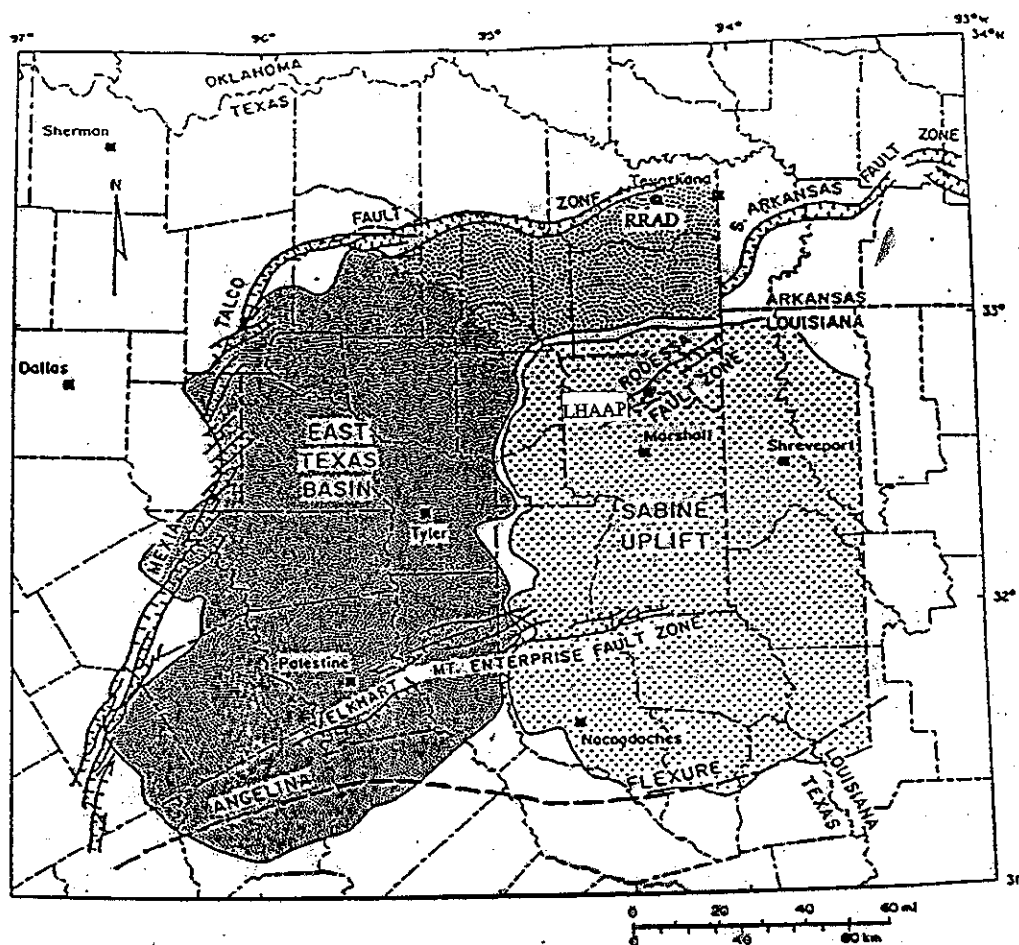
**History of Previous Work**

**TAPP Studies**

Prior and similar TAPP studies in the vicinity of Landfill 16 (LF 16) and the Burning Ground 3/ Unlined Evaporation Pond (BG3/UEP) revealed that local channel sands of an ancient buried meander loop of ancestral Harrison Bayou are in contact with buried contaminants in LF 16 and BG3/UEP. In both cases, the channel sands act as preferential pathways of migration of contaminated groundwater. Localized interaction of contaminated groundwater with surface water of the current Harrison Bayou has resulted in local contamination of surface waters of Harrison Bayou.

This is a very significant discovery because containment remediation procedures can be greatly simplified by intercepting the localized contamination in channel sands. The contaminated groundwater can then be traced to points of contact with source material(s). Thus a major portion of these areas can be eliminated as a source area for groundwater and subsequent surface water contamination.





## EXPLANATION

- |                        |                      |
|------------------------|----------------------|
| East Texas Basin       | Sabine Uplift        |
| Mexia-Talco Fault Zone | Red River Army Depot |

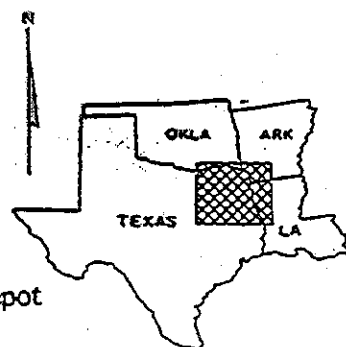


Figure 1: Modified after Baumgardner, Jr. (1987). Generalized boundaries of East Texas Basin and Sabine Uplift. Delineated on south by Angelina Flexure, on west and north by Mexia-Talco Fault System, on east by Sabine Uplift. Study area is located in Harrison Co., Texas, 35-40 miles west of Shreveport, Louisiana.

**TAPP Report****Page 2****Regional Studies**

This geologic study and the implications of the results can better be understood by a better understanding of the geologic history of the area, as determined and compiled by the investigator over years of study and work in the East /Northeast Texas areas. The results of these studies have been utilized in several LHAAP, LSAAP and RRAD environmental studies and reports, and they were published in TNRCC publication AS-156/SR, "Data Compilation, Utilization, and Results for Risk Assessment / Remediation: Western Industrial Complex Area Red River Army Depot, Texarkana, Texas", February 1998. Ideas were also presented at the Third Symposium on Superfund Risk Assessment, January 15, 1998 in San Diego, California.

The following is a summary of the investigator interpretation of the Wilcox/Midway Geology of LHAAP, Sabine Uplift Area, Texas, gained from present and previous studies. Near the end of Cretaceous Time, some 60 million years ago, as the Dinosaurs were dying out, a shallow inland sea (East Texas Basin) began to develop in the area situated between the present cities of Texarkana to the north, Dallas to the west, Shreveport to the east, and Angelina/Caldwell to the south. The inland sea developed as the Old Cretaceous Surface began to subside (Fig. 1). Hundreds of feet of sands, silts, clays and calcareous sediments were deposited in this slowly subsiding shallow sea during the following 50+ million years. These included the dark-colored, calcareous marine shales of the Midway Formation, and the overlying (younger) fluvial sands, silts, and clays of the Wilcox Formation.

Longhorn Army Ammunition Plant is located along the eastern margin of the former Basin, over the northern portion of the buried Sabine Uplift (a buried dome approximately 75 miles in diameter and centered along the Texas-Louisiana Line in the vicinity of Shreveport, Louisiana (Fig. 1). Near the end of Midway Time, renewed uplift of the Sabine Uplift, possibly coupled with crustal movements (subsidence) in the deeper portions of the Basin to the west, resulted in upward tilting and exposure of the bottom sediments (Midway Formation) along the eastern and northern margins of the Basin. A new drainage network, consisting of a series of rills, creeks, and rivers, developed on this newly emerging surface. Detailed studies by the investigator have confirmed that this drainage network is essentially the ancestor of the present Goose Prairie Creek, Harrison Bayou, Central Creek, etc. drainage network, millions of years later. Vertical incisement of 200 feet or more into the Midway Formation by the newly created drainage network occurred as the streams attempted to reach the new base level (new shoreline of the East Texas Basin to the west).

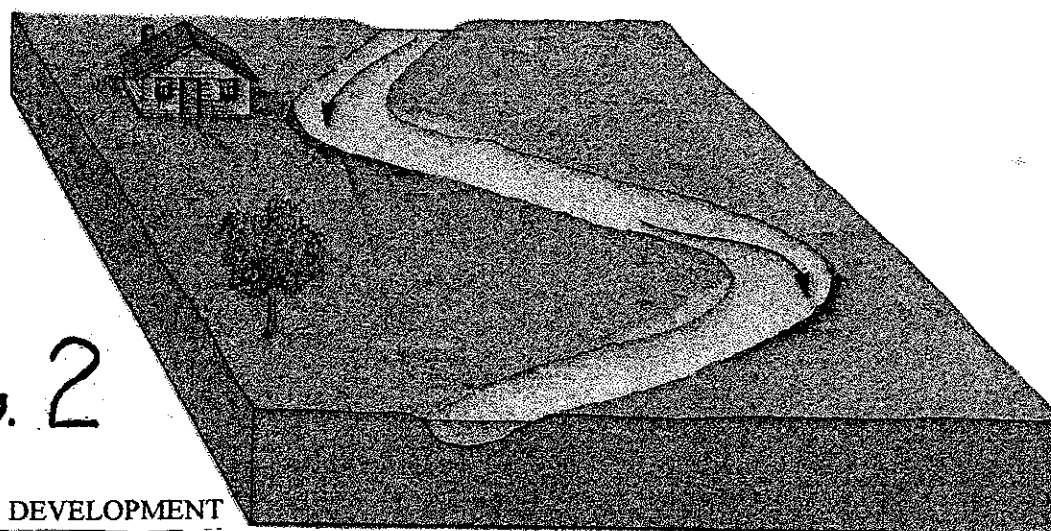
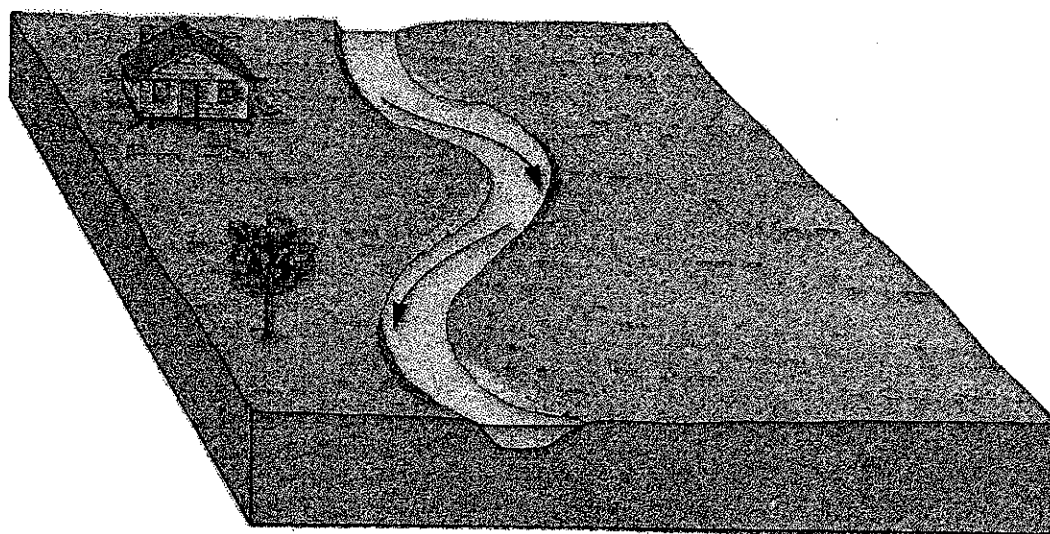
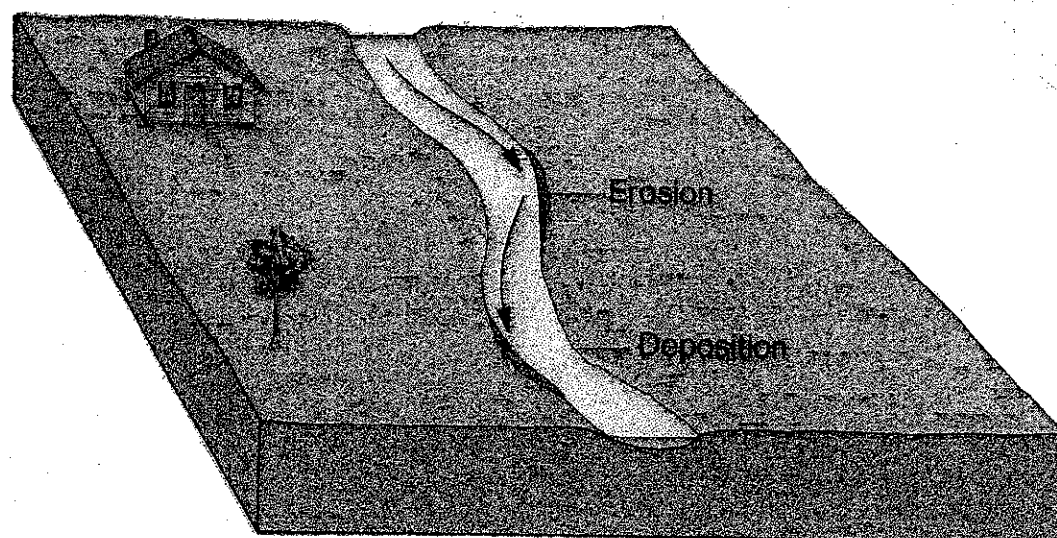


FIG. 2

MEANDER DEVELOPMENT

**TAPP Report  
Page 3**

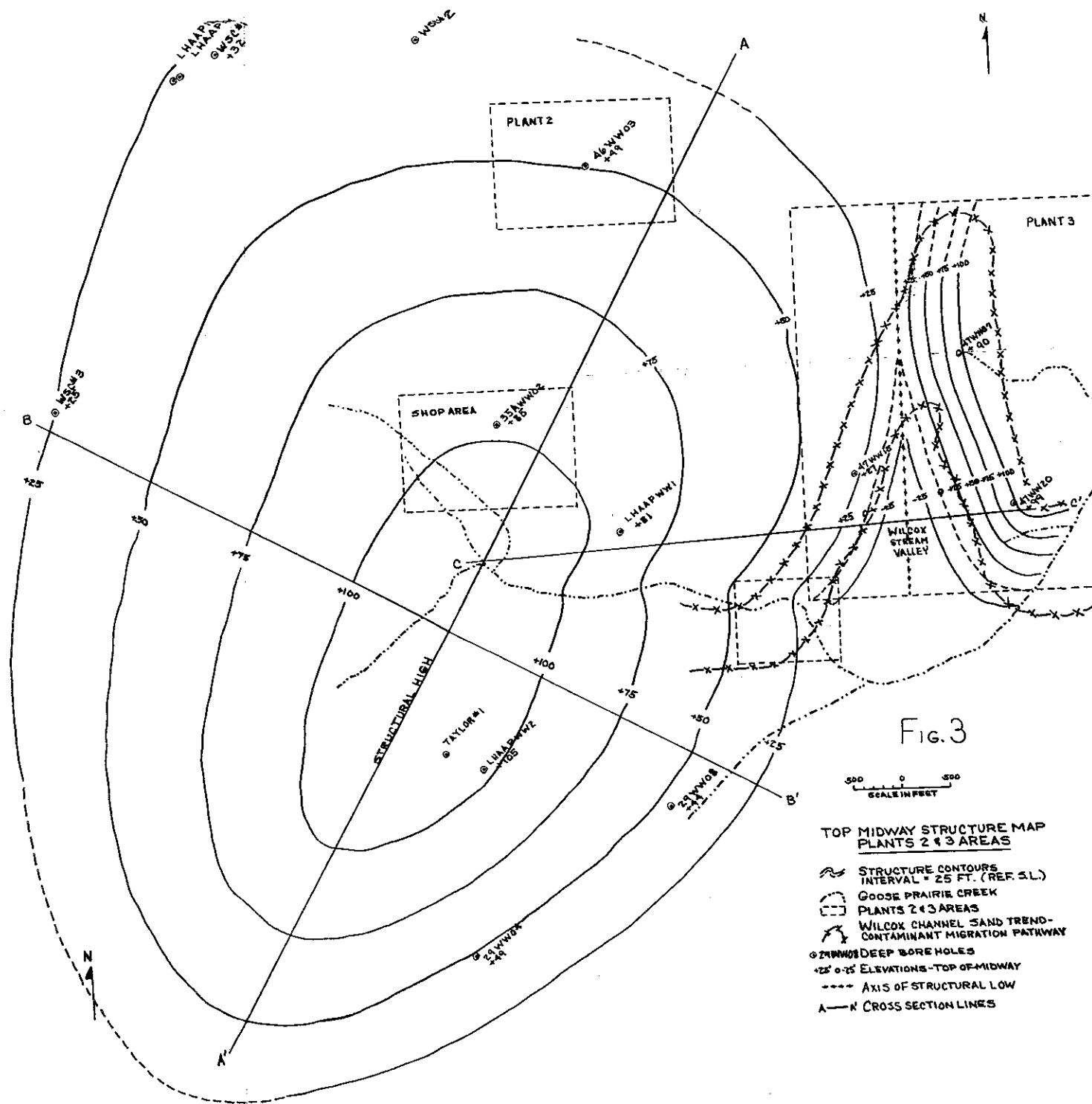
When the new base level was ultimately reached, stream gradients became less, water velocities slowed, resulting in dumping of suspended and bedload sediment being transported, filling the stream channels. The streams had to shift laterally (meander) to avoid the filled channels, resulting in lateral cutting and widening of stream valleys (Figure 2). Simultaneous sheet erosion on and slumping of stream valley walls, coupled with erosion by tributaries, contributed to widening of the stream (alluvial) valleys.

As these valleys were being widened, they were also being filled with channel deposits, floodplain deposits, and backswamp deposits, typical fluvial aggradational types of deposits. For example, the current Goose Prairie Creek and Harrison Bayou are only 30' or so wide and less than 5 feet deep, but over a 50 million period of time, they have carved valleys over 125 feet deep and approximately 2000 feet wide. Currently they are almost completely filled with typical fluvial deposits.

Coarser sedimentary materials (sands, etc.) were deposited in active stream channels where water velocities were sufficient to keep most silt and clay-sized particles suspended. During floods when the water spilled over the banks (particularly on the outside bends of meanders) into the wide floodplains, water velocities slowed and the finer silts and clays were ultimately deposited as floodplain and backswamp deposits. See Figure 2 for mechanism of development of meanders.

Woody plants grew in low areas on the floodplain and were ultimately covered by hundreds of feet of overburden. Increased pressure and heat, due to the weight of the overlying overburden, ultimately converted this woody organic matter to lignite. Lignite in the Wilcox Formation is a primary energy source in the State of Texas, accounting for approximately 20 % of the States electricity generation, and is consistently present in the Longhorn Wilcox backswamp deposits.

Thicker sequences of sand occur on the inside bends of former stream meanders (point bar sands). Stream channels shifted positions many times during the erosion and filling of the resulting valleys, resulting in a valley full of vertically stacked and laterally displaced channel sands encased in impervious floodplain and backswamp silts, clays and lignite (Fig. 5)



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**Page 4**

The Wilcox Formation (100 to 320 feet thick) is the surface outcropping formation at Longhorn, and groundwater movement, both laterally and vertically, is normally very slow (inches per year) in the floodplain and backswamp deposits, but movements in the channel sands may be up to several feet per day. Therefore, due to the limited and isolated occurrence of channel sands, groundwater contamination is not widespread at Longhorn.

Shallow groundwater at Longhorn is not utilized for drinking water; therefore, the only time when contaminated groundwater becomes a problem is when localized channel sands are in contact with buried contaminants in landfills, production building sumps, etc. The resulting contaminated groundwater can then move relatively fast via these sands to locations where groundwater occasionally mixes with surface water, contaminating the surface water. This situation is known to occur at only three sites at Longhorn, Landfill 16, BG3/UEP and Plant 3 of the Plant Production Area.

Detailed mapping of these old stream valleys and buried channel sands has greatly simplified the ultimate resolution to groundwater contamination problems at Longhorn, if this data is adopted and utilized. This information has been, or can be, utilized to isolate the source(s) of contamination, the preferential pathway of migration of contaminated groundwater, the point of possible contamination of surface waters, and the potential receptors of said contamination. This type data is invaluable in conducting both Human Health and Ecological Risk Assessments, and opens up several remediation options for Longhorn, e.g., source removal, groundwater interception, in situ remediation, natural attenuation with time, etc.

#### **Methods and Results of Investigation**

A Top Midway Structure Map was constructed in the PPA (Fig. 3) utilizing data gained from logs generated from 11 wells deep enough to penetrate the underlying Midway Formation. These well locations are shown on the PPA Base Map (Fig. 4). The map generated from this data reveals the presence of a large NE-SW trending, nearly symmetrical, anticline in the western part of the area, Cross Sections A-A' and B-B', and a large structurally low area in the eastern part of the area, Cross Section C-C' (Figure 5). The low area is an abandoned and filled alluvial valley carved by a meandering ancestral Goose Prairie Creek. The presence of the anticline to the west influenced the original development and direction of flow of the new surface drainage in the area, including Goose Prairie Creek. This subsurface structure resulted in an overlying topographic high that mirrors the underlying anticline.





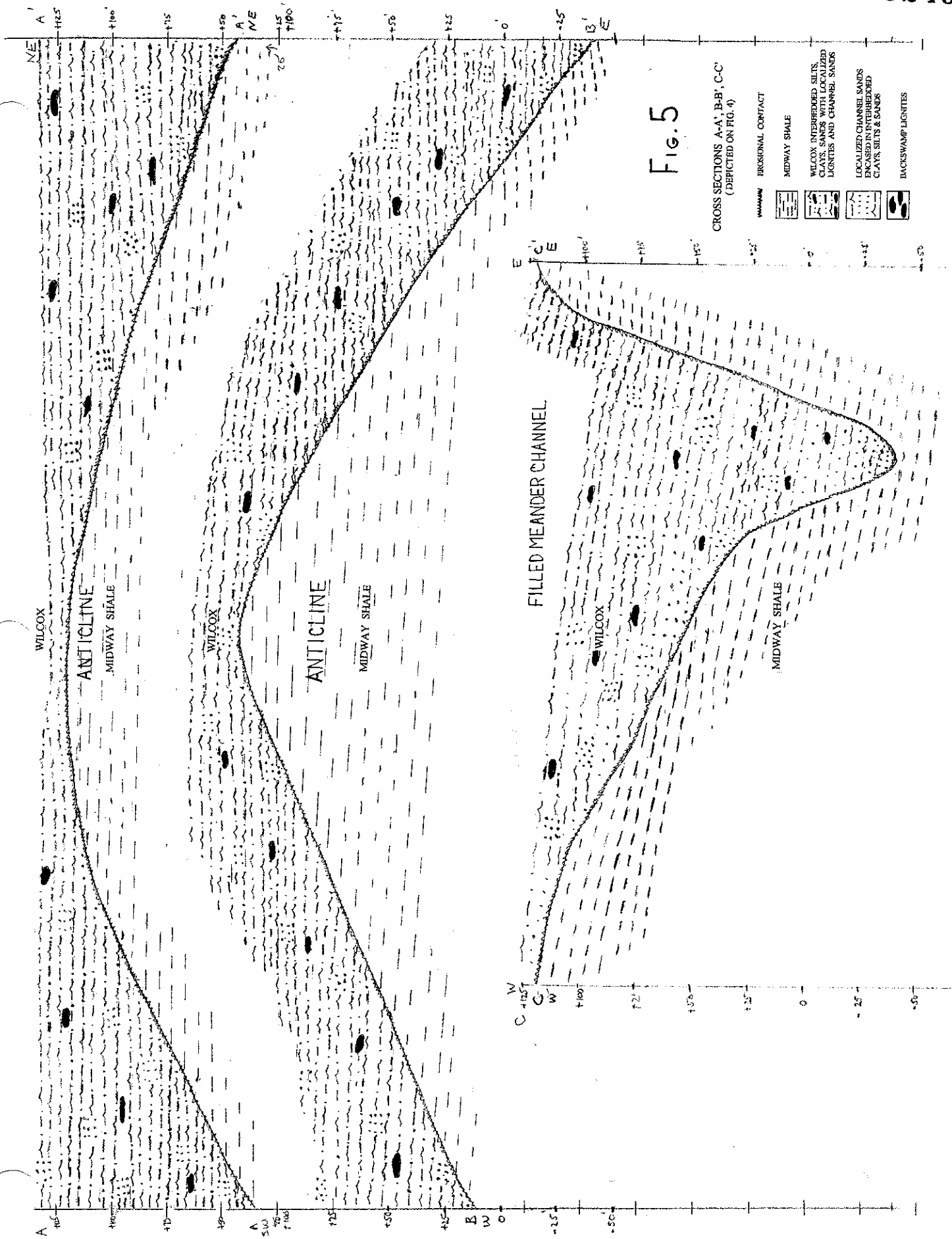
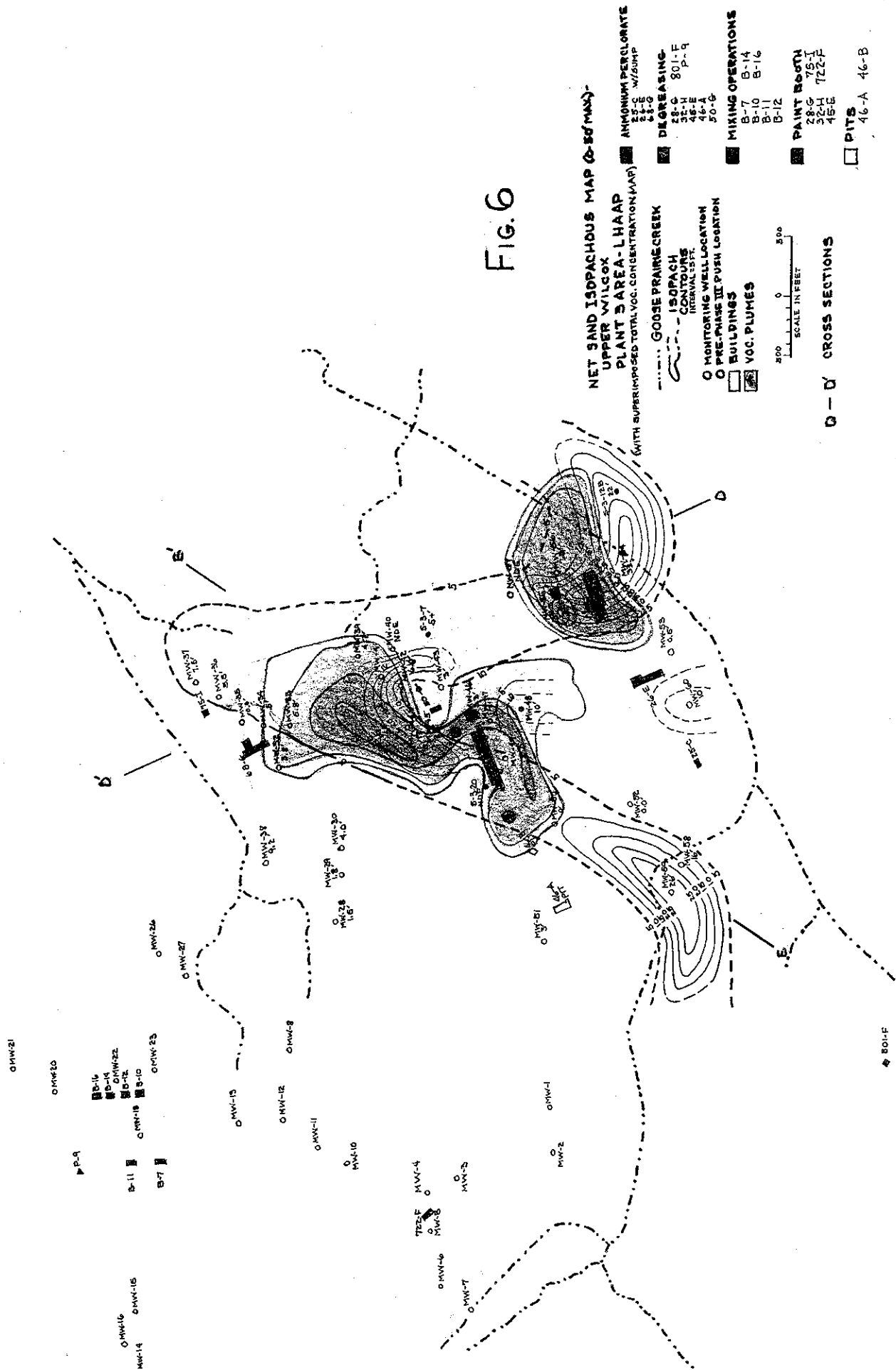


Fig. 5

CROSS SECTIONS A-A', B-B', C-C'  
(DEPICTED ON FIG. 4)

Fig. 6





TOTAL VOC CONCENTRATION VALUES IN UG/L

- 5-10
- 10-100
- 100-1,000
- 1,000-10,000
- 10,000-100,000
- 100,000+

- STREAM
- RAILROAD
- SWAMP
- MONITORING WELL LOCATION
- GOOSE PRAIRIE CREEK SAMPLING POINT
- PRE-PHASE III PUSH LOCATIONS

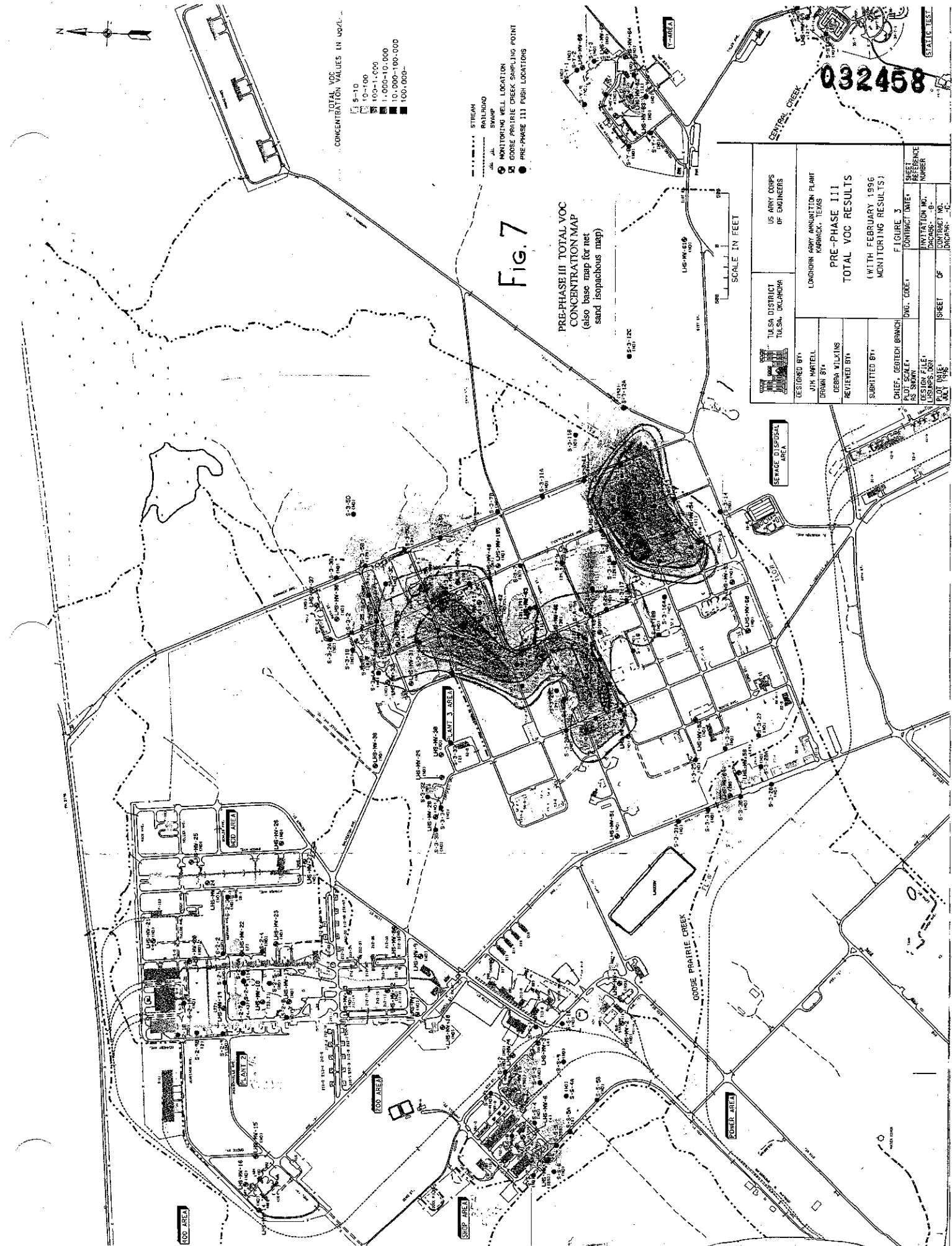
Fig. 7

PRE-PHASE III TOTAL VOC CONCENTRATION MAP (also base map for net sand isopachous map)

SCALE IN FEET

|                                   |  |                                                                                  |  |
|-----------------------------------|--|----------------------------------------------------------------------------------|--|
| TULSA DISTRICT<br>TULSA, OKLAHOMA |  | US ARMY CORPS<br>OF ENGINEERS                                                    |  |
| DESIGNED BY:<br>JIM WATTELL       |  | LONGHORN ARMY AMMUNITION PLANT<br>KIRKWOOD, TEXAS                                |  |
| DRAWN BY:<br>DEBRA WILKINS        |  | PRE-PHASE III<br>TOTAL VOC RESULTS<br>(WITH FEBRUARY 1996<br>MONITORING RESULTS) |  |
| REVIEWED BY:                      |  | FIGURE 3                                                                         |  |
| SUBMITTED BY:                     |  | SHEET<br>REFERENCE<br>NUMBER                                                     |  |
| CHIEF, GEOTECH BRANCH             |  | CONTRACT DATE:                                                                   |  |
| PLOT SCALE:                       |  | CONTRACT NO.:                                                                    |  |
| DESIGN FILE:                      |  | DRAWING NO.:                                                                     |  |
| LUS-MS-001                        |  | DRAWING NO.:                                                                     |  |
| PLOT DATE:                        |  | CONTRACT NO.:                                                                    |  |
| JULY 1996                         |  | DRAWING NO.:                                                                     |  |

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**Page 5**

Goose Prairie Creek originated near the crest of the topographic high, flowing eastward until it reached the eastern flank of the high and then flowed northward along this topographic low before turning eastward toward the present day Plant 3 Area. Encountering resistance, it then meandered southeastward toward the present channel of Goose Prairie Creek, which ultimately proceeded eastward toward the present day Caddo Lake. Even today, the NE-SW trending topographic high forms a drainage divide with drainage from the NE, E and SE side of the crest of the high flowing eastward, ultimately into Caddo Lake. The drainage W and NW of the crest of the high flows into Big Cypress Bayou to the N- NW. The latter discovery is important because contaminants from the Shop Area and PPA can not possibly affect water quality in the Caddo Lake Water Supply Corporation wells (WSC #1,2 &3). These wells are located immediately adjacent to the NW corner of the installation (Fig. 4). These wells supply water to local communities, including Karnack, Uncertain, etc. Local citizens have expressed the fear of possible contamination over the years.

Many years and cycles of upstream erosion, downstream transport, etc. introduced large volumes of sediments into the ancient meander valley in the Plant 3 Area. Much of this sediment was ultimately deposited in the valley as channel deposits (including point bar sands), unsorted over-bank deposits, floodplain deposits, and back-swamp deposits. The type depended on the load and transport ability of the stream (Fig. 5). A net sand isopachous map was constructed from data obtained from monitor wells and pre-phase III push logs to determine the net sand distribution within the ancient meander alluvial valley (Figure 6). Well locations utilizing during this mapping are shown on the base map (Fig. 7) adopted for this phase of the investigation. The isopachous map reveals the presence of three large pods of sand (point bar sands) located on the inside bends of the ancient meander loop. These localized sand bodies lend credence to the accuracy of the subsurface mapping which revealed the presence of the isolated meander loop.

Simultaneous sheet erosion on and slumping of stream valley walls, coupled with sediment input from tributaries, contributed to the lateral meandering and filling of the valley. Once the stream gradient decreased considerably, the lateral valley cutting and filling accelerated. As the velocity of the stream entering the loop decreased, more of the load was deposited on the inside bend of the entrance meander, eventually plugging the entrance to the meander.

Fig. 8



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During this phase of development, the higher stream velocities on the outside bend of the entrance meander channel eroded the eastern channel wall until this eroding action, coupled with deposition on the inside of the meander, eventually straightened out the stream channel and isolated the broad meander loop. Figure 2 briefly illustrates the development of meanders.

The isolated meander loop became an oxbow lake, which eventually completely filled in. This resulted in creation of a meander scar, which was ultimately covered by younger Wilcox deposits. The current Goose Prairie Creek flows in the almost completely filled and straightened channel. Figures 3 & 5 reveal that during the course of development of Goose Prairie Creek, the meandering process carved an alluvial valley 1700 to 2000 feet wide and in excess of 125 feet deep in the vicinity of the Plant 3 Area.

Plant Production records were reviewed to try to determine what production activities were conducted in each of the production buildings. The results reveal that production activities in the buildings changed over the years, sometimes several times. The buildings were color coded to depict type(s) of operations, as accurately as possible, and superimposed on the isopachous map (Fig. 6). The U.S. Army Corps of Engineers, Tulsa, Oklahoma, generated a Total VOC Plumes Map (February 1996) from data obtained from the Plant Production Area monitor wells and pre-phase III push locations (Fig. 8). Total VOC plumes from this map were superimposed on the base map (Fig. 7) which were in turn superimposed on the isopachous map (Fig. 6). They were placed on the net sand isopachous map in order to determine if there is an association between the occurrence of contaminants coming from plant activities and sand distribution. Sand distribution may possibly control directions, volumes and velocities of movement of contaminants.

Total VOC plumes appear to be associated with plant production activities in the different buildings, as expected. The plumes appear to be streamlined in a N-NE direction away from the source areas located in the western portion of the meander loop, and in a S-SE direction in the eastern portion of the loop. Without the influence of the localized ancient stream channel and contained sand deposits, groundwater controlled plumes should move uniformly in a S-SE direction away from the sources and toward the topographically lower Goose Prairie Creek.

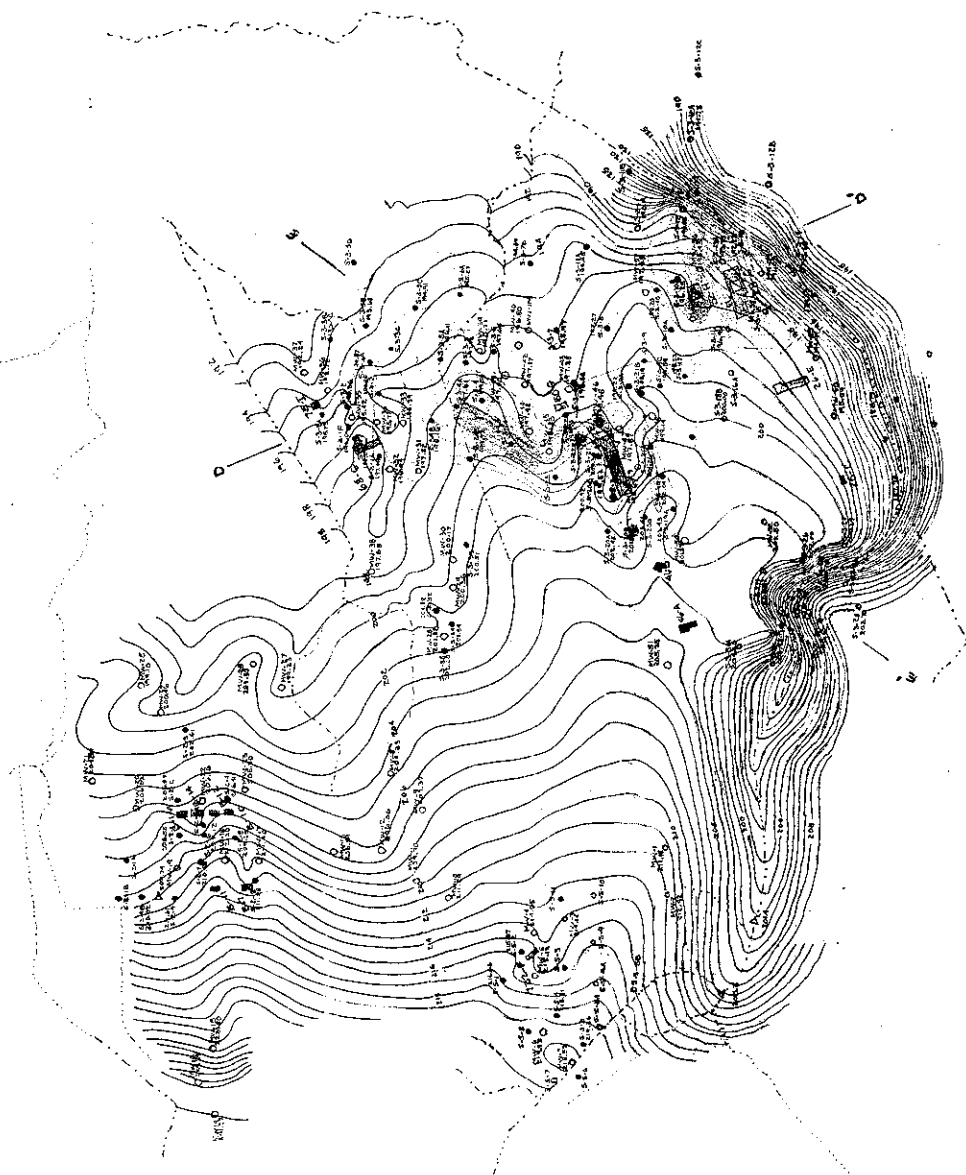
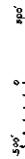


Fig. 9

TOPOGRAPHIC MAP -  
PLANT PRODUCTION AREA  
LHAAP

- |                       |            |      |
|-----------------------|------------|------|
| AMMONIUM PERBICARBATE | 75% w/samp | 18.6 |
|                       | 18.6       | 18.6 |
| DEGREASING            | 801-F      | 18.6 |
|                       | 18.6       | 18.6 |
|                       | P-9        | 18.6 |
|                       | 44-A       | 50.6 |
|                       | 50.6       |      |
| MIXING OPERATIONS     |            |      |
|                       | B-7        | 8-14 |
|                       | B-0        | 8-16 |
|                       | B-11       |      |
|                       | D-12       |      |
| PAINT BOOTH           |            |      |
|                       | 28.6       | 75.7 |
|                       | 28.6       | 72.7 |
|                       | 45.6       |      |
| PITS                  |            |      |
|                       | 46-A       | 46-B |



D'

MW-33 1964

MW-41 1967

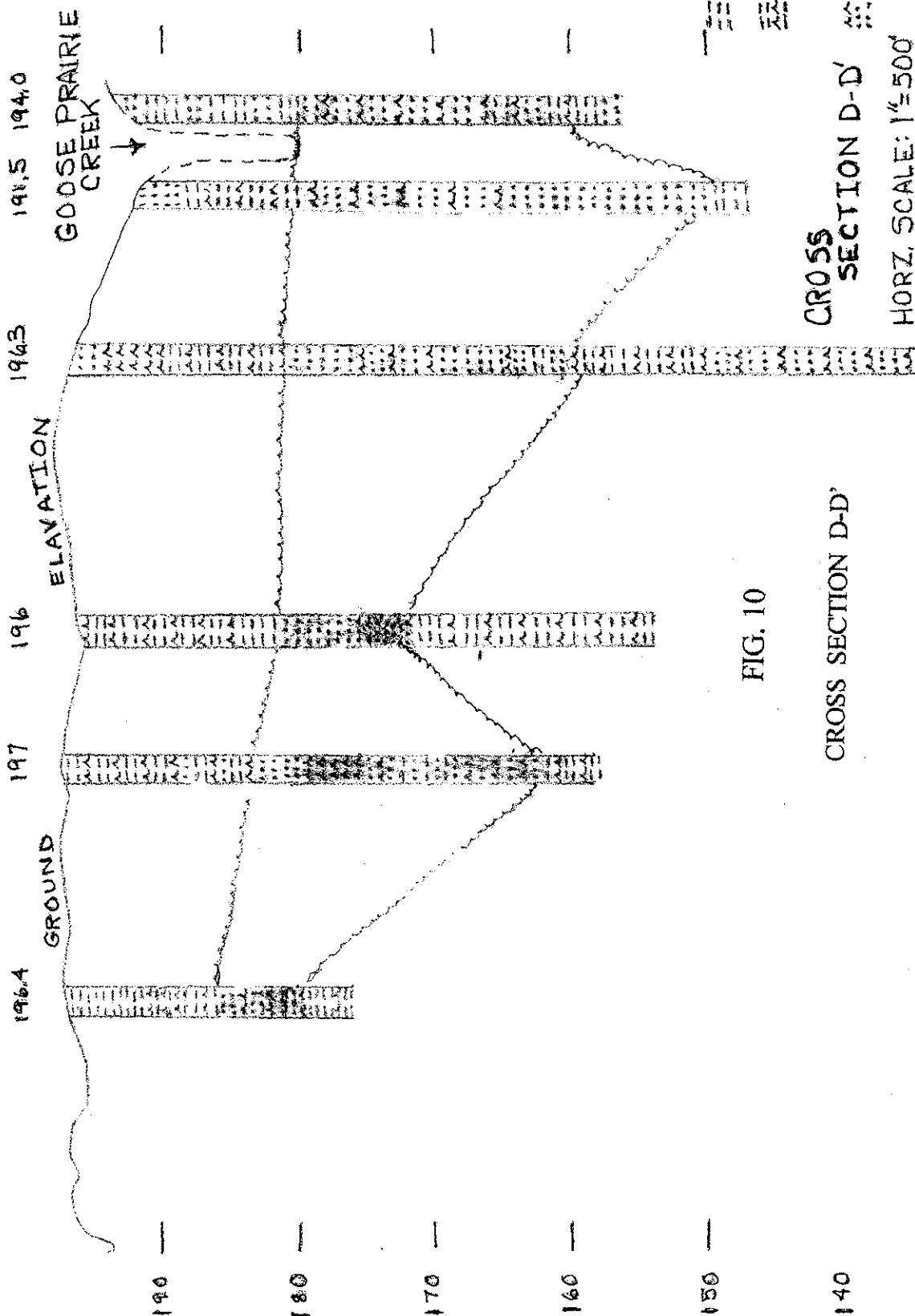
S-3-7 196

S-3-10B 1963

MW-54 191.5 194.0

S-3-12B

D



CLAY  
SILTY CLAY  
SILTY SAND  
SAND  
SALT

CROSS SECTION D-D'  
HORIZ. SCALE: 1"=500'  
VERT. SCALE: 1"=10'

FIG. 10

CROSS SECTION D-D'

E

032464

MW-58

MW-50

MW-49 MW-47

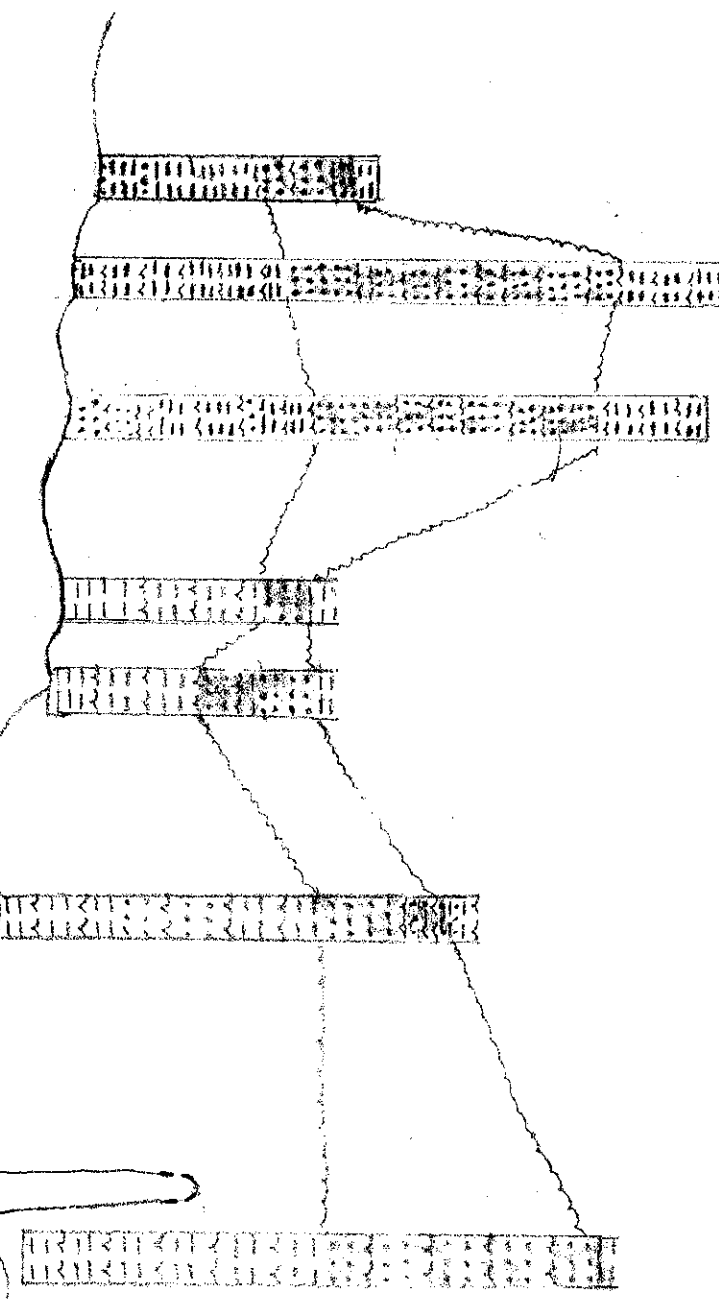
200.2 201.9 198.7 197.9

GOOSE PRAIRIE CREEK

MW-44 MW-41 MW-39  
197.5 197.0 195.7

GROUND ELEVATION

200 —  
190 —  
180 —  
170 —  
160 —  
150 —  
—



CLAY  
SILTY CLAY  
SILTY SAND  
SAND  
SILT

FIG. 11  
SECTION E-E

CROSS SECTION E-E  
HORIZ. SCALE: 1"=500'  
VERT. SCALE: 1"=10'

E

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Contaminants from Buildings 46-B, 45-E, and possibly from 50-G, appear to be moving northeastward via the more porous and permeable channel sands. Eventually, groundwater movement in the point bar sands appears to move the plume eastward and then southward toward the ancient channel intersection with the channel of the present day Goose Prairie Creek. Contaminants from building 68-G appear to move eastward toward the ancient stream channel, and once in, they move southward in the channel toward Goose Prairie Creek. Contaminants from 28-G and 32-H probably move extremely fast via point bar sands toward Goose Prairie Creek.

A topographic map (contour interval = 1 ft.) was constructed of the Plant 3 Area Surface from ground elevations surveyed for Monitor Wells and Pre- Phase III push locations (Fig. 9). The stream channel was separately surveyed for the investigator, compliments of the USACOE. The purpose for the topographic map was to determine the surface drainage directions, and most importantly, to determine if the present day Goose Prairie Channel is vertically incised into the ancient meander channel sands. This would result in possible surface water contamination by contaminated groundwater. Cross section D-D' (Fig. 10) strongly suggests that the present channel is in fact incised into channel sands of the ancient channel. The highest concentration of contaminants sampled by LHAAP personnel in Goose Prairie Creek traditionally occur at this location. Concentrations in creek water decrease upstream and downstream from this location, probably due to dilution.

Cross section E-E' (Fig. 11) suggests that the present creek channel is not incised deeply enough to encounter ancient channel sands of the upstream arm of the ancient meander loop. This discovery, plus the indication that the contaminants are moving northward in the ancient stream channel, could explain why there aren't large concentrations of contaminants observed in the creek at this location. The ancient stream channel slopes toward the N-NE at this point, probably influencing local groundwater to move in that direction.

### **Conclusions and Significance of Investigation**

Discovery of the buried meander loop in the Plant Production Area is of great practical and environmental significance. Permeable sands in the ancient stream valley appear to determine the direction, volume and rate of movement of contaminated groundwater. The channeled groundwater appears to ultimately migrate to one central location, where it mixes with and is diluted by surface waters of Goose Prairie Creek.

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This revelation should greatly simplify the ultimate resolution of the groundwater contamination problem at the Plant Production Area. It greatly reduces the size of the area(s) needing study and possible remediation, thus significantly reducing the time and resources needed to address the problem. Information from this study can be utilized to isolate the source(s) of contamination; the preferential pathway(s) of migration of contaminants; the point of contamination of surface waters; and the potential receptors of said contamination.

A knowledge of the mechanism that control groundwater movement opens up a number of containment/remediation options, e.g., contaminant interception and removal and treatment, e.g. interceptor trenches, extraction wells and treatment at the present treatment plant; source removal; in situ remediation; or natural attenuation with time. Choosing the right option will significantly reduce the risk to human health and the environment and, hopefully, result in the speedy transfer of this property to FWS.

Location of the large NE-SW trending anticline and the overlying topographic high offers a secondary benefit. These features present a barrier to potential northwest migration of contaminated surface and groundwater from the Shop and Plant Production Areas toward the Caddo Lake Water Supply Wells. These wells are located immediately adjacent to the northwest corner of the installation (Fig. 3 & 4). They provide water for Karnack, Uncertain and the surrounding communities. Local citizens have expressed concern over the years pertaining to possible contamination of these wells. In years past, the TAPP representative did a study of the area and supplied results from this study to Susan Prosperie of the Texas Department of Health and members of the Caddo Lake Water Supply Board. This information appeared to alleviate their fears at the time. That information coupled with this new information should completely alleviate their fears.





ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-2000

032467

OCT 2 - 2003

Honorable Marianne Lamont Horinko  
Acting Administrator  
U.S. Environmental Protection Agency  
Ariel Rios Building, Mail Code 5101  
Washington, DC 20460

Dear Ms. *Marianne* Horinko:

The Environmental Protection Agency (EPA) and the Department of Defense have worked hard over the previous months to resolve the issue of our respective agencies roles in Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) response actions. We appreciate your Agency's commitment to this dialogue. As we have discussed, I have determined that my office will support the two Department of Defense approaches enclosed: (a) an approach based on the Navy Principles; and (b) an approach based on the Air Force Principles. My office will fully support our components in either approach, to further accomplishment of the President's Management Agenda by replacing an "emphasis on process" with a "focus on results."

I understand that EPA fully supports the Navy Principles, but that the Agency, at this time, may have reservations over the Air Force approach. As we have discussed, however, I understand that EPA headquarters, though exercising appropriate policy supervision, will neither require nor forbid the Regions from negotiating on the basis of either approach. It is our hope that this dual-track, interim approach can lead to improvements in the administration of both our programs and in the protection of the environment.

Again, let me express my sincere appreciation for your Agency's constructive approach to this complex and important issue.

Sincerely,

*Ray*

Raymond F. DuBois  
Deputy Under Secretary of Defense  
(Installations and Environment)

Enclosures



## PRINCIPLES AND PROCEDURES FOR SPECIFYING, MONITORING AND ENFORCEMENT OF LAND USE CONTROLS AND OTHER POST-ROD ACTIONS

### PREAMBLE

Since the Department of Defense (DoD) /Environmental Protection Agency (EPA) Model Interagency Agreement (IAG)/Federal Facility Agreement (FFA) was developed in 1988, EPA and Navy have gained considerable knowledge and understanding about post-Records of Decisions (ROD) activities, especially Land Use Controls (LUCs). Thinking, policies, regulations and procedures concerning LUCs have evolved considerably since DoD and EPA developed the 1988 FFA model language. New statutes and regulations related to LUCs are being considered in many states. Accordingly, EPA and the Department of the Navy (DON) believe that a set of Principles will assist Navy field commands and EPA Regions to better implement our respective Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) responsibilities. The Principles described below do not replace or substitute for any existing CERCLA statutory or regulatory requirement. Rather they provide a mutually agreeable framework to provide a more efficient process to implement LUCs at National Priority List (NPL) installations.

These Principles will guide the EPA and DON personnel involved in these decisions. They are written in full knowledge that state regulatory and trustee organizations have independent responsibilities and authorities. EPA and the DON recognize the importance of the state role in helping to ensure a cleanup is protective of human health and the environment. Headquarters EPA and DoD will jointly develop a communications plan to ensure we include the states in this important issue.

These Principles support the President's Management Agenda by focusing on improving environmental results. The Principles encourage continued innovation and improvement in CERCLA implementation. EPA and the Components should continue to propose and pilot initiatives at Component installations or at other properties for which they are responsible. This includes proposing variations in, or alternatives such as performance-based practices to, the approach described in this document.

### PRINCIPLES

- At sites where remedial action is determined necessary to protect human health and the environment, the actions must be documented in accordance with CERCLA and its implementing regulation, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

- At sites where contaminants are left in place at levels that do not allow for unrestricted use, LUCs are used to ensure that the contaminants do not pose an unacceptable risk to human health or the environment. LUCs consist of engineering controls and/or institutional controls.
- The EPA and DON desire to ensure that LUCs are specified, implemented, monitored, reported on, and enforced in an efficient, cost-effective manner that ensures long-term protectiveness. In addition, in accordance with CERCLA and the NCP, if an equally protective but more cost-effective remedy is identified, DON may propose, and EPA will consider, using the more cost-effective remedy.
- The EPA acknowledges the DON's role and responsibilities as the Federal Lead Agent for response actions. This role includes selecting remedies with EPA at NPL sites and funding response actions.
- The DON acknowledges EPA's role and responsibilities for regulatory oversight and enforcement at NPL sites. This role includes ultimate ability to select the remedy at NPL sites if EPA disagrees with DON's proposed remedy and dispute resolution fails.
- Federal Facilities Agreements (FFAs) are CERCLA 120 agreements used by DON and EPA to describe in detail the roles and relationships among DON, EPA and often the state. They form the foundation for these relationships regarding DON's response actions at NPL sites. FFAs also contain installation specific details and procedures for planning, budgeting, and dispute resolution. DON and EPA desire FFAs to be as standardized as possible and relatively static (i.e., the FFA should not need to be changed for a given installation).
- Primary Documents developed under the FFA are relatively dynamic and document important plans and actions. In that sense, they are action-oriented. For example, a Site Management Plan is revised yearly via collaboration among DON and EPA remedial project managers and is an important tool for planning response actions and demonstrating commitment to the public. Likewise, a LUC Remedial Design (RD) or Remedial Action Work Plan (RAWP) describes those actions that are needed to ensure viability of both long-term engineered and institutional control remedies.
- Records of Decision should document the remedy selection process and remedy decision in accordance with CERCLA and the NCP, as well as applicable and

appropriate guidance, regulations, standards, criteria, and policy. With regard to LUCs, the ROD should describe the LUC objectives; explain why and for what purpose the LUCs are necessary, where they will be necessary, and the entities responsible for implementing, monitoring, reporting on and enforcing the LUCs. The ROD will refer to the RD or RAWP for implementation actions.

- Where situations arise (such as new cleanup standards; new or additional contamination is discovered on a site, etc.) that require additional response actions that go beyond the actions and objectives described in a ROD, and any related ROD Amendment or Explanation of Significant Difference (ESD), the additional actions required and their remedial objectives will be further documented in an ESD or ROD Amendment, as appropriate. There may also arise situations after a remedy has been completed that require removal actions to protect human health and the environment, such as the newly discovered contamination posing an imminent risk to human health. In such circumstances, documentation as required in the removal process should be created.
- Given the above, EPA and DON agree that the most efficient framework for specifying, implementing, monitoring, reporting on and enforcing LUCs is:
  - a standard FFA for NPL sites,
  - a clear, concise RoD with LUC objectives, and
  - a RD or RAWP with LUC implementation actions.

*Note: These documents are described more fully below.*

- EPA and DON will move expeditiously to finalize all outstanding FFAs using a standard FFA template as a guide to minimize the development/writing process.

*Note: A "standard FFA" means the Agreement presently being used between EPA and DoD using the DoD-EPA model language, plus site-specific statements of fact, plus the additional primary document shown in Attachment (1).*

- EPA and DoD will initiate a task force with appropriate headquarters and field representatives from EPA and the military services. The task force will make recommendations as to how to ensure that the same documentation can be used to memorialize both remedial action completion and deletion, as well as to determine the process whereby DoD and EPA will document the completion of the remedial actions required by the ROD in a single primary document. The task force will examine ways to reduce document size, review time, and revisions. The task force will recommend changes to guidance and policy that will help reduce document

size or streamline the process in order to manage costs. The task force may also include other stakeholders.

After reviewing the task force recommendations EPA and DoD will determine how to ensure that the same documentation can be used to memorialize both remedial action completion and deletion, as well as to determine the process whereby DoD and EPA will document the completion of the remedial actions required by the ROD in a single primary document. In addition, EPA and DoD will streamline the remedial process and better manage costs. While the efforts of the Task Force are meant to complement the Principles described above, its work is separate from the Principles and must not impede their implementation. The work of the Task Force also must not impede completion or closeout of individual sites or operable units.

## GENERAL PROCEDURES

### 1. Federal Facility Agreement

- The LUC implementation and operation/maintenance actions will be included in the RD or RAWP which are already primary documents deliverable under standard FFAs. In addition, the same documentation as determined by the task force and approved by the Parties to memorialize both the remedial action completion and deletion will be provided as a primary document for new FFAs. For existing FFAs without such a primary document, this document will be provided as an attachment to the RD or RAWP with the same enforceability as a primary document.

Note: Model FFA language will need to be supplemented to reflect these Principles and Procedures. Attachment (1) contains necessary modifications to FFA language.

### 2. Record of Decision

- It is EPA's and DON's intent that Records of Decision (RoDs) continue to be consistent with CERCLA and the National Contingency Plan. Relative to land use controls and institutional controls, the ROD shall:
  - Describe the risk(s) necessitating the remedy including LUCs;
  - Document risk exposure assumptions and reasonably anticipated land uses;
  - Generally describe the LUC, the logic for its selection and any related deed restrictions/notifications;
  - State the LUC performance objectives. (See attachment (2) for examples of

- LUC performance objectives);
  - List the parties responsible for implementing, monitoring, reporting on, and enforcement of the LUC;
  - Provide a description of the area/property covered by the LUC (should include a map);
  - Provide the expected duration of the LUCs; and
  - Refer to the RD or RAWP for LUC *implementation actions*, since these details may need to be adjusted periodically based on site conditions and other factors. (See attachment (2) for examples of LUC implementation actions).
- The ROD at transferring properties will need to be crafted based on the responsibilities of the new owner and state-specific laws and regulations regarding LUCs. At transferring properties, compliance with the LUC performance objectives may involve actions by the subsequent owners in accordance with deed restrictions, however, ultimate responsibility for assuring that the objectives are met remains with DON as the party responsible under CERCLA for the remedy. DON and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at a transferred property.

### 3. LUC Remedial Design (RD) or Remedial Action Work Plan (RAWP)

- The RD or RAWP will be provided as a primary document in accordance with the FFA.
- The RD or RAWP will describe short and long-term implementation actions and responsibilities for the actions in order to ensure long-term viability of the remedy which may include both LUCs (e.g., institutional controls) and an engineered portion (e.g., landfill caps, treatment systems) of the remedy. The term "implementation actions" includes all actions to implement, operate, maintain, and enforce the remedy. Depending on the LUC and site conditions, these actions can include:
  - Conducting CERCLA five-year remedy reviews for the engineered remedies and/or LUCs.
  - Conducting periodic monitoring or visual inspections of LUCs; frequency to be determined by site-specific conditions.
  - Reporting inspection results.
  - Notifying regulators prior to any changes in the risk, remedy or land use including any LUC failures with proposed corrective action.
  - Including a map of the site where LUCs are to be implemented.



*For active bases,*

- Developing internal-DON policies and procedures with respect to LUC monitoring, reporting, and enforcement in order to institutionalize LUC management and to ensure base personnel are aware of restrictions and precautions that should be taken; Consulting with EPA at least 14 days prior to making any changes to these policies and procedures to ensure that any substantive changes maintain a remedy that is protective of human health and the environment.
- Developing a comprehensive list of LUCs with associated boundaries and expected durations.
- Notifying regulators of planned property conveyance, including federal-to-federal transfers. "Property conveyance" includes conveying leaseholds, easements and other partial interests in real property.
- Obtaining regulator concurrence before modifying or terminating land use control objectives or implementation actions.

*For closing bases/excess property:*

- Notifying regulators of planned property conveyance, including federal-to-federal transfers.
- Consulting with EPA on the appropriate wording for land use restrictions and providing a copy of the wording from the executed deed.
- Defining responsibilities of the DON, the new property owner and state/local government agencies with respect to LUC implementation, monitoring, reporting, and enforcement.
- Providing a comprehensive list of LUCs with associated boundaries and expected durations.
- Obtaining regulator concurrence before modifying or terminating land use control objectives or implementation actions.

*Note: The mix of responsibilities among DON, the new property owner, and other government agencies depends on state and federal laws and regulations that are applied in the state. Implementation actions at closing bases may include elements characteristic of both active and closing bases, depending on the timing of transfer.*

- Should there be a failure to complete LUC implementation actions at an active base, the EPA Region shall notify the installation and seek immediate action. Should there be a failure to complete LUC actions after such notification to the base, EPA may notify the Deputy Assistant Secretary of the Navy (Environment) who will ensure that LUC actions are taken.

- Should there be a failure to complete implementation actions that are the responsibility of a subsequent owner or third party at a transferred property, EPA and DON will consult on the appropriate enforcement action. Should there be a failure to complete implementation actions that are the remaining responsibility of DON at a transferred property, the EPA Region will notify the cognizant Navy Engineering Field Division. If necessary, EPA may notify the Deputy Assistant Secretary of the Navy (Environment) who will ensure that corrective action is taken.

*Note: The RD or RAWP should contain no more or no less implementation actions than needed to ensure the viability of the remedy. There is a delicate balance required. EPA and DON both desire to ensure protectiveness while minimizing process and documents. The parties agree to work diligently to define the appropriate implementation actions for each LUC. EPA and DON believe the key elements can be easily developed between RPMs in a matter of a few hours. Based on detailed discussions and the examples shown in Attachment (2), EPA and DON expect that the LUC portion of the RDs or RAWPs to be in the range of 2-6 pages. If combined with a sampling plan, there may be additional pages needed to list the analyses, sampling locations and frequencies.*

#### 4. LUC Data

- The DON will ensure that all LUCs at its installations are included in the Service LUC database.

#### Attachments:

1. Incorporating Land Use Control (LUC) Objectives and Implementing Actions into Federal Facilities Agreements (FFAs)
2. Examples of LUC objectives and LUC Implementation Actions

## Attachment I

# INCORPORATING LAND USE CONTROL (LUC) OBJECTIVES AND IMPLEMENTATION ACTIONS INTO FEDERAL FACILITIES AGREEMENTS (FFAs)

## FFA Model Template Additions/Changes

### 1. Definitions Section:

Add: "Land use controls" shall mean any restriction or administrative action, including engineering and institutional controls, arising from the need to reduce risk to human health and the environment.

### 2. Primary Documents:

Add: A document memorializing remedial action completion.

*Note: EPA and DoD believe it is important that a primary document: (1) document the completion of remedy-in-place and/or site close-out and (2) receive concurrence from EPA. The task force discussed above will make recommendations on the scope and content of the document, and DoD and EPA will determine this document after reviewing the task force recommendations. In the meantime, EPA and DoD shall enter into FFAs which include a primary document memorializing remedy completion. The document shall not duplicate information in the Administrative Record or previously provided to EPA. Previously provided information shall be referenced and itemized. New information/data (e.g., sampling data) may be needed to demonstrate that the Remedial Action Objectives have been met. The report shall also include any as-built drawings for remedies if different from the remedial design. EPA and DoD do not envision this to be a lengthy document, but shall contain only the information needed to justify the remedy completion. EPA and DoD believe the document should discuss how the remedial objectives in the ROD have been met. It should not be used to expand the scope of requirements beyond the remedial actions required in the original ROD or any subsequent amendment or explanation of significant difference. Instead, if new requirements are needed for a protective remedy, these will be documented in an Explanation of Significant Difference or ROD Amendment, as appropriate, prior to reaching the milestone. The EPA and DoD will determine the precise nature of this document after reviewing the task force's recommendations.*

**Change:** Eliminate the sub-bullets (subsidiary documents) under remedial action work plan for document streamlining purposes.

## Attachment 2

**EXAMPLES OF LUC OBJECTIVES AND LUC IMPLEMENTATION ACTIONS**

(Note: Actions are to be tailored to site-specific conditions.

This is neither a mandatory nor a complete list)

**LUC OBJECTIVES (contained in ROD)**

- Ensure no construction on, excavation of, or breaching of the landfill cap.
- Ensure no residential use or residential development of the property.
- Ensure no withdrawal and/or use of groundwater.
- Ensure no excavation of soils without a use permit and special handling procedures.

**LUC IMPLEMENTATION ACTIONS (contained in the RD or RAWP)**

- Conduct a CERCLA five-year remedy review of the LUC and provide to EPA for review.
- Conduct annual inspections of the LUC and report results (active or BRAC – responsible party to be defined).
- Record the LUC in the base master plan. (active)
- Produce a survey plat of the LUC by a state registered land surveyor. (active or BRAC).
- File the survey plat with the local government/Circuit Court for purposes of public notification (active or BRAC)
- Place a survey plat in CERCLA administrative record, and send copies to EPA and state. (active or BRAC).
- Develop and implement a base procedure that requires excavation to be approved by the Public Works Officer or equivalent official. (active)
- Develop and implement a base procedure that requires changes in land use to be approved by the Public Works Officer or equivalent official. (active)
- Notify the regulatory agencies 45 days in advance of any Base proposals for a major land use change at a site inconsistent with the use restrictions and exposure assumptions described in the RoD, any anticipated action that may disrupt the effectiveness of the land use controls, any action that might alter or negate the need for the land use controls, or any anticipated transfer of the property subject to the land use controls.
- Obtain regulator concurrence before modifying or terminating land use control objectives or implementation actions.
- Maintain a comprehensive list of LUCs with associated boundaries and expected durations.

*Note: These examples are consistent with draft EPA guidance: "Describing Institutional Controls in Remedy Decision Documents at Active Federal Facilities".*

PRINCIPLES OF AGREEMENT FOR  
PERFORMANCE-BASED RECORDS OF DECISION  
IN ENVIRONMENTAL RESTORATION

1. *The President's Management Agenda* clearly directs federal agencies to reform their activities to prioritize performance and results so that "emphasis on process will be replaced by a focus on results." Thus the focus of the Air Force's (AF) environmental restoration program is to select, implement, maintain, and where necessary review and monitor remedial action results that protect human health and the environment. EPA has joint responsibility with the AF to select the remedy at National Priority List (NPL) facilities, and an interest in confirming that such remedies remain in place and continue to be protective. The actions of both agencies should reflect the President's direction to restore freedom to manage to responsible agencies, eliminating excessive command and control, approval mechanisms and red tape that hinder efficiency.
2. Records of Decision (RODs) are public documents that should direct: (i) remedy implementation based on performance needed to achieve remedial objectives, (ii) notification and dialogue among parties, (iii) reasonable access to sites for performance verification, and (iv) accountability for performance on the part of the AF.
3. The AF has the responsibility and obligation to carry out the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and National Contingency Plan (NCP) requirements as it implements, maintains, and where necessary reviews and monitors protective remedies needed to achieve remedial objectives.
4. Restoration resources in the form of time, money and personnel should be focused on defining remedial objectives (i.e., results) and the essential actions required to achieve those objectives. Such objectives and essential actions are enforceable requirements of the ROD under CERCLA and the NCP.
  - a. The ROD should be streamlined to contain remedial objectives, essential implementation and maintenance actions to achieve the objectives, and other content elements required by CERCLA and the NCP. These performance objectives in the ROD, supported by the "essential actions" taken to meet them, are enforceable requirements of the remedy.
  - b. The Air Force must still determine the detailed steps to take to carry out actions that achieve remedial objectives. This can include, as appropriate, O&M plans or detailed implementation plans; the details of such documents will be shared with regulators for review and comment, but are not subject to additional EPA approval and enforcement beyond that applied to the ROD, subject to Section 8 below.
  - c. The ROD should not require new or further deliverables and documents, or contain repetitive information, and should use cross-references, existing data, templates, and remedy selection assumptions wherever it makes sense and is cost-effective to do so.

5. The Air Force will be held accountable to achieve the remedial objectives and essential actions identified in the ROD. This means being prepared for enforcement action should the Air Force fail to perform its essential responsibilities.

- a. The Air Force remains subject to CERCLA enforcement mechanisms by EPA, states, and citizens if it fails to implement and maintain a protective remedy, such as, but not limited to, citizen suits, civil penalties, etc.
- b. The Air Force remains subject to stipulated penalty provisions where existing Federal Facilities Agreements (FFAs) identify RODs as "primary documents."

6. The Air Force will agree to provide essential information to EPA, states and the public regarding the status of achieving performance objectives and essential actions identified in the ROD. EPA and states can independently verify such information through reasonable access to documents and facilities. Depending on site-specific risk factors that may warrant a change in reporting frequency, the expectation is that an annual summary report will be appropriate, supplemented by additional prompt reporting of any remedy deficiency or failure that presents or could imminently lead to an actual risk to human health and the environment, and the actions taken or planned to address and correct such deficiency or failure. Such limited monitoring and reporting, as described here, is an exception to the prohibition on post-ROD implementation measures reflected in the 23 Jan 2002 Air Force Policy and Guidance on Remedy Selection Documentation in Records of Decision (RODs).

7. Because "success" and "compliance" will be defined in terms of achieving performance objectives and essential actions, rather than meeting document exchange deadlines, Air Force personnel must foster and maintain dialogues with the regulators, particularly concerning technical implementation issues. Work plans or other technical documents that are not independently enforceable or subject to regulator approval should nonetheless undergo review by all parties to ensure compatibility with ultimate remedial objectives. The failure to do so will increase the likelihood of a legitimate challenge by the regulators and the public as to whether remedial action objectives in fact are being achieved (or have been achieved, if a closeout determination is at issue).

8. Integration of Performance-Based Response Actions with existing FFAs and RODs:

- a. The process improvements developed as part of the Air Force performance-based principles do not change obligations under existing FFAs or RODs. However, parties to existing FFAs may amend them or interpret them to incorporate these performance-based actions and improvements.

- b. If an existing FFA already addresses implementation, O&M plans, or completion and review provisions (e.g., identifies an O&M plan as a "primary" document"), then such documents should conform to the enforceable objectives and actions contained in the ROD.



- c. The Air Force should update the ROD as necessary to protect human health and the environment in conformance with Section 300.415 of the National Contingency Plan (i.e. perform a ROD amendment for fundamental changes, or an Explanation of Significant Difference (ESD) for significant changes, or record non-significant or minor changes in the post-ROD site file). If the Air Force finds that such an update is necessary, it should be done in accordance with the approach defined by these principles. In particular, if hazardous substances are left in place above unlimited use and unrestricted exposure levels, the 5-year review affords the Air Force an opportunity to confirm the conclusions in an existing ROD or to update the ROD if differences significantly or fundamentally alter the basic features of the selected remedy with respect to scope, performance or cost.
- d. The Air Force shall incorporate these principles both in negotiating future Interagency Agreements and in modifying existing FFAs.

**Federal Facilities Restoration and Reuse**Recent Additions | Contact Us | Search:  **GO**[EPA Home](#) > [OSWER](#) > [Federal Facilities Restoration and Reuse](#) > [Guidance on the Resolution of the Post-ROD Dispute](#)**Guidance on the Resolution of the Post-ROD Dispute**

November 25, 2003

**MEMORANDUM****SUBJECT:** Guidance on the Resolution of the Post-ROD Dispute**FROM:** James E. Woolford, Director  
Federal Facilities Restoration and Reuse Office, OSWERDavid J. Kling, Director  
Federal Facilities Enforcement, OECA**TO:** Superfund National Program Managers, Regions 1 - 10  
Office of Regional Counsel, Regions 1-10

The purpose of this memorandum is to confirm the resolution of the post-Record of Decision (ROD) dispute as described in the October 2, 2003 letter from Raymond Dubois, Jr., Deputy Under Secretary of Defense (Installations & Environment) and confirmed by Marianne Horinko, Acting Administrator for EPA on October 24, 2003, and to provide guidelines for implementation of this resolution. (See Attachments 1 and 2 for the letters). Regions should begin discussions immediately, resources permitting, with the Services on RODs and other documents that have been delayed by the dispute. We recognize that there is a tremendous backlog of work to be accomplished, and Regions need to prioritize which projects to address. Obviously, those projects that most directly will help the Agency meet its strategic goals and objectives such as NPL construction completions, should receive higher consideration.

Regions should apply the revised Navy Principles, which are ready to implement, to RODs and Federal Facility Agreements/Interagency Agreements (FFAs/IAGs). We understand that the Army and the Defense Logistics Agency (DLA) will use the Navy Principles, as well. Regions should also consider, on a site-specific basis, alternate language for RODs and FFAs/IAGs that the Air Force may propose. (See Attachment 2). We have been told that as a result of the post-ROD resolution, DoD will suspend its 72-hour review requirement for RODs and FFAs/IAGs that conform to either the Air Force or Navy Principles. This should expedite approvals. We also understand that DoD will suspend or modify any of its current policies that are inconsistent with these Principles.

As you can see in Attachment 1, the Navy Principles provide extensive discussion and direction regarding the regulatory oversight role in the remedy implementation phase, including requirements for operation and maintenance of the remedy (including any engineered and non-engineered portions) and developing RODs, Remedial Designs, Remedial Action Work Plans, documents memorializing remedial action completion, and FFAs/IAGs at Federal facilities on the National Priorities List. Given the collaboration with our offices and the Regions by the Navy and the Army in developing these Principles, we anticipate that you will find implementation

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to be straightforward.

While EPA did not work with the Air Force in developing its "Principles of Agreement for Performance-Based Records of Decision in Environmental Restoration" (and the details of how these Principles would apply in practice is not yet known), EPA agreed that our Headquarters and Regional offices would give full and fair consideration of the Air Force's Principles on a site-specific basis. Consistent with EPA's and the Air Force's responsibilities to ensure the long-term viability of land use controls and to enter into FFA/IAGs at NPL sites, Regions should work with the Air Force to address any issues of concern that may arise as you consider application of the Air Force's Principles in the development of a site-specific ROD. Issues of concern and solutions developed, if any, should be shared with our office contacts-Allison Abernathy of FFRRO and Sally Dalzell of FFEO. As we develop experience with the Air Force Principles, additional guidance will be provided.

As you know, CERCLA and the National Contingency Plan (NCP), as well as EPA's related policy and guidance, provide for a great deal of flexibility in remedy selection, implementation and operations and maintenance. As a program, we have also encouraged innovation to streamline the CERCLA processes to increase overall efficiency, reduce costs and expedite cleanup. There are a few basic tenets that must be met as we move forward with the Navy and Air Force Principles.

&lt;

li> Remedies must be consistent with CERCLA and the NCP. Consequently, whether remedies are developed using the Navy or Air Force Principles, when evaluated in their totality, they must meet the nine criteria established by the NCP.

- It is EPA's position that CERCLA does not authorize the Services to issue RODs unilaterally. Please advise us if you are aware of a situation where a Service intends to issue a ROD unilaterally.
- Primary documents, described in existing FFAs/IAGs, are enforceable. At installations with no FFAs/IAGs, it is our expectation that, at a minimum, the final remedial design document will be subject to EPA review and approval along with the remedial action workplan, consistent with the 1988 EPA/DOD Model IAG.
- Based upon our current familiarity with the Navy Principles, these principles should be used as a point of departure at this time in any discussions with Federal agencies and the Services, including the Air Force. The Navy Principles articulate the minimum criteria for what to include in a ROD, Remedial Design (RD)/Remedial Action Work Plan for Institutional Controls (ICs), and for all post-ROD documents from DoD. Although a ROD, RD/Remedial Action Work Plan does not have to exactly reflect the Navy Principles, it is our expectation that they will provide substantially similar information, requirements, objectives, etc., as is described in the Navy Principles' "General Procedures."
- Based on our experience at several sites, we expect that the Air Force will propose placing all the IC detail directly into the ROD. This approach may work well at sites where the facility has an existing and effective facility-wide system to implement and monitor the necessary land use control system and the IC requirements are simple and unlikely to change with time. At a minimum, the IC detail in the ROD should be functionally consistent with the ROD and RD IC elements described in the Navy Principles.

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- If a Service proposes to eliminate post-ROD documents such as the Operation and Maintenance Plan and a Document Memorializing Remedial Action Completion, Regions should consider this only where the requirements for the substantive information in these documents are detailed in the ROD or we are requiring the actions through an enforceable document elsewhere.<sup>1</sup> When placing the substantive requirements in the ROD, it is our expectation that EPA will continue to receive appropriate post-ROD documents for information purposes. In all cases, EPA must review and approve all post-ROD actions needed to ensure protective cleanups. However, EPA does not have to review and approve monitoring reports.
- Depending on site-specific circumstances it may not be possible to place all the necessary detail in the ROD (e.g, if there is a lack of comprehensive base-wide monitoring system for land use controls, the implementation actions are not decided at the time of the ROD, or if many areas require ICs and these areas have a range of different IC needs, etc.) In such instances, additional enforceable requirements subject to EPA's oversight authority would be required to ensure a protective remedy. It will also be necessary to provide mechanisms in the ROD for revisiting the effectiveness of the measures/objectives during the remedy implementation process (RD, RA or O&M stages).
- Where using only a ROD to describe ICs, Regions must ensure that only the institutional control remedy design details and a the engineering design details of the remedy are included in the ROD. The engineering details would ordinarily be contained in the Remedial Design (RD). The engineering requirements for the remedy must still be described in a separate RD.
- Regions should work to reduce document size, review time, and revisions, whenever and wherever possible.
- It is EPA's position that EPA must concur on documentation for site close-out. The scope and terminology for such documentation are to be considered by an EPA-DoD task force. The task force will examine potential consolidation and streamlining of close-out and de-listing documents. In the meantime, Regions should accept Remedial Action Completion Reports or documents containing equivalent information.

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<sup>1</sup>For instance, in some FFAs such as the Region 9 March Air Force Base FFA, the Air Force is required at the completion of the remedial action to prepare a project closeout report that all requirements of the agreement have been completed. EPA and the State must concur on the Air Force's determination that the agreement has been satisfied.

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Please continue to coordinate closely with our office contacts - Allison Abernathy of FFRRO and Sally Dalzell of FFEO - on IC language prior to selecting a remedy and signing all draft and draft final Federal Facility RODS and Institutional Control Remedial Designs until further notice. Please allow two weeks review time at headquarters, although we expect to complete our review in much less time. If you have questions on how to proceed, please contact Allison Abernathy at 703-603-0052 or Sally Dalzell at 202-564-2583.

Attachments

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cc: Marianne Horinko, Office of Solid Waste and Emergency Response  
JP Suarez, Office of Enforcement and Compliance Assurance  
Tom Dunne, Office of Solid Waste and Emergency Response  
Barry Breen, Office of Solid Waste and Emergency Response  
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Susan Bromm, Office of Site Remediation Enforcement  
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Linda Garczynski, Office of Brownfields Cleanup and Redevelopment  
Stephen Lufiig, Land Revitalization Group  
Earl Salo, Office of General Counsel  
Federal Facility Leadership Council

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Attachment 1 for EPA's Guidance on the Resolution of the Post-ROD  
Dispute 11/25/03:  
EPA Response Letter to DoD's Post-ROD Principles, October 24, 2003

Attachment 2 for EPA's Guidance on the Resolution of the Post-ROD  
Dispute 11/25/03:  
DoD Principles and Procedures for Specifying, Monitoring, and Enforcement  
of Land Use Controls and Other Post-Record Of Decision (ROD) Action,  
October 2, 2003

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**Status of Technical Documents  
Longhorn Army Ammunition Plant  
Monthly Managers Meeting  
June 02, 2004**

| No. | Documents in Progress                                                                | Submittal Date | Comments Due/Received from USACE/ Regulators                | Comment Resolution | Status                | Remarks                                                                                                                               |
|-----|--------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------|--------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Revised Draft-Final Rev 01 Feasibility Study, Site-12 to regulators                  | 2/27/04        | EPA comments rec'd: 5/14/04<br>TCEQ Comments rec'd: 5/27/04 |                    | Submitted. In review. | Comments received from EPA on 5/14/04 and from TCEQ on 5/27/04. Other comments are pending.                                           |
| 2   | Draft Final Soils Report – Background Study                                          | 3/01/04        | TCEQ comments rec'd: 5/17/04                                |                    | Submitted. In review. | Comments received from TCEQ on 5/17/04. Other comments are pending.                                                                   |
| 3   | LHAAP-32 Revised Draft Final Feasibility Study Report                                | On hold        | -                                                           | -                  | On hold.              | Document submittal to regulators is on hold until sampling is performed. Funding is being requested for sampling.                     |
| 4   | Final ECOP document                                                                  | 5/21/04        | NA                                                          | NA                 | Submitted.            | Revised Final ECOP submitted on 5/21/04. No comments are expected.                                                                    |
| 5   | Draft Feasibility Study, LHAAP-67                                                    | 6/14/04        | 6/28/04                                                     | 7/10/04            | In preparation.       | To be submitted to USACE for review.                                                                                                  |
| 6   | Revised Draft Final Work Plan, Installation-wide Baseline Ecological Risk Assessment | 9/01/04        | 10/13/04                                                    | 11/03/04           | In preparation        | Step 3 is currently in progress. The work plan revision is also in progress. Results of Step 3 will be incorporated in the work plan. |
| 7   | Evaluation of USFWS and USACHPPM data from LHAAP-45                                  | 6/17/04        |                                                             |                    |                       | In preparation                                                                                                                        |

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# UXO Presentation

June 2, 2004

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|                    |                           |              |                |                                 |

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DEPARTMENT OF ARMY  
CORPS OF ENGINEERS, TULSA DISTRICT  
1645 SOUTH 101<sup>ST</sup> EAST AVENUE  
TULSA, OKLAHOMA 74128-4609

14 June 2004

Subject: Perchlorate Delineation Sampling  
Longhorn Army Ammunition Plant  
February 2004

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Fort Chaffee, AR 72905

**Overview:**

Perchlorate was detected in two adjacent surface soil samples (interval 0'-0.5') collected by the US Fish and Wildlife Service (USFWS) in a remote area of the southern portion of Longhorn Army Ammunition Plant (LHAAP) during two sampling events conducted between April 2002 and May 2003. Confirmation sampling to define the extent of perchlorate at these locations was jointly conducted by the US Army Corps of Engineers (USACE) and the USFWS in February 2004. The coordinates for the confirmation sampling locations were determined prior to mobilizing to the field and samples were collected by USACE personnel accompanied by a USFWS representative. Perchlorate was not detected at any of the February 2004 sampling locations. The original USFWS sampling locations and the USACE delineation sampling locations are shown on Figure 1. Sampling results for each location are shown on Figure 2.

**Discussion:**

In April and May 2002, the USFWS collected 43 surface soil samples in the western portion of LHAAP. Samples were analyzed for a series of constituents including perchlorate. The samples were analyzed for perchlorate by the laboratory of The Institute of Environmental and Human Health (TIEHH) at Texas Tech University using a modification of EPA method 314.0 for soils with minimum reporting limit of 8 ug/kg. At sampling location 1 perchlorate was detected at a concentration of 269 ug/Kg. This sampling effort and results were documented in the report titled "Contaminants Investigation of Western

Portion of Caddo Lake National Wildlife Refuge, Texas 2002 (Project ID No. 94420-02-Y037)".

During March and April 2003, the USFWS collected surface soil samples from 200 sites in the northern, southern and eastern portions of LHAAP as documented in the report "Contaminants Investigation of Northern, Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas 2003 (Project ID No. 1902-2007-21420)". The samples were analyzed for perchlorate at the same laboratory (TIEHH) as the previously described sampling event with a minimum reporting limit of 8 ug/kg. At Site 53, which is northeast of Site 1, perchlorate was detected at a concentration of 122 ug/Kg.

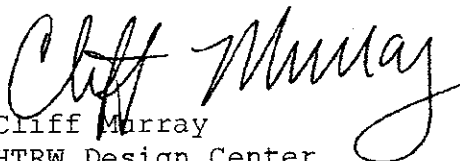
On 25-26 February 2004, to define the extent of perchlorate in the area of these detections, twenty-six (26) samples were collected on a 50 meter grid. Samples were collected from the 0'-0.5' interval using a disposable scoop for each location. The samples were numbered consecutively to continue the numbering sequence used by the latest sampling conducted by the USFWS. The first sample collected was designated Caddo-SS-250. Sample locations 250 and 263 were selected to represent the interval between the two delineation sample areas to determine the presence, if any, of perchlorate between the two sampled areas. At site 250, the sample was collected from the bottom of a ditch-like feature that was oriented approximately northwest to southeast. The ditch was sampled to determine if runoff waters containing the perchlorate anion may have accumulated in this feature.

The samples collected in February were shipped to General Engineering Laboratories, Inc. of Charleston, South Carolina and analyzed for perchlorate using method SW 846 8321 modified. This method utilizes ion chromatography coupled with mass spectrometry (IC-MS) and is capable of lower detection levels than the previously used method (EPA 314.0). Additionally, due to the speciation provided by the mass spectrometer, the occurrence of false positive results is reduced as compared to EPA method 314.0. Due to the reduction in false positives method 8321 is preferred by the Department of Defense for perchlorate analysis.

As shown on Figure 2, perchlorate was not detected in any of the samples collected. Table 1 provides a listing of the results and the applicable method detection limits (method detection limit) and reporting limit

**Conclusion:**

Sampling conducted in February 2004 failed to confirm the presence of perchlorate or define a pattern of perchlorate distribution around or between the two adjacent detections found during previous sampling events conducted by the USFWS. No site related gradient was evident in the sampling area. Perchlorate, though extremely soluble, has been shown to be extremely stable in surface soil conditions. Although rainfall would be expected to dissolve a portion of the perchlorate in surface soil, the low detection limits of the analytical method utilized would be expected to result in perchlorate detection in soil where a residue of perchlorate would have existed. The investigated area is remote to plant operations where perchlorate was utilized and the expectation of detecting perchlorate in the soils in this area is extremely low. One possible explanation for the two USFWS detections is that they are false positive results generated from the use of method 314.0. Based on these results it appears that perchlorate is not present in these areas and further sampling either subsurface or laterally is not warranted.



Cliff Murray  
HTRW Design Center  
Technical Manager

Table 1. February 2004 Perchlorate Analytical Results

| Sample ID    | Result | Units | Method<br>Detection<br>Limit | Reporting<br>Limit |
|--------------|--------|-------|------------------------------|--------------------|
| Caddo-PS-250 | ND     | ug/kg | 1.340                        | 5.360              |
| Caddo-PS-251 | ND     | ug/kg | 0.605                        | 2.420              |
| Caddo-PS-252 | ND     | ug/kg | 0.587                        | 2.350              |
| Caddo-PS-253 | ND     | ug/kg | 0.688                        | 2.750              |
| Caddo-PS-254 | ND     | ug/kg | 0.672                        | 2.690              |
| Caddo-PS-255 | ND     | ug/kg | 0.632                        | 2.530              |
| Caddo-PS-256 | ND     | ug/kg | 0.633                        | 2.530              |
| Caddo-PS-257 | ND     | ug/kg | 0.584                        | 2.330              |
| Caddo-PS-258 | ND     | ug/kg | 0.638                        | 2.550              |
| Caddo-PS-259 | ND     | ug/kg | 0.601                        | 2.410              |
| Caddo-PS-260 | ND     | ug/kg | 0.593                        | 2.370              |
| Caddo-PS-261 | ND     | ug/kg | 0.643                        | 2.570              |
| Caddo-PS-262 | ND     | ug/kg | 0.636                        | 2.540              |
| Caddo-PS-263 | ND     | ug/kg | 0.655                        | 2.620              |
| Caddo-PS-264 | ND     | ug/kg | 0.655                        | 2.620              |
| Caddo-PS-265 | ND     | ug/kg | 0.667                        | 2.670              |
| Caddo-PS-266 | ND     | ug/kg | 0.647                        | 2.590              |
| Caddo-PS-267 | ND     | ug/kg | 0.668                        | 2.670              |
| Caddo-PS-268 | ND     | ug/kg | 0.608                        | 2.430              |
| Caddo-PS-269 | ND     | ug/kg | 0.624                        | 2.500              |
| Caddo-PS-270 | ND     | ug/kg | 0.592                        | 2.370              |
| Caddo-PS-271 | ND     | ug/kg | 0.612                        | 2.450              |
| Caddo-PS-272 | ND     | ug/kg | 0.570                        | 2.280              |
| Caddo-PS-273 | ND     | ug/kg | 0.610                        | 2.440              |
| Caddo-PS-274 | ND     | ug/kg | 0.690                        | 2.760              |
| Caddo-PS-275 | ND     | ug/kg | 0.634                        | 2.540              |

DL Detection Limit

RL Reporting Limit

ND Non-Detect

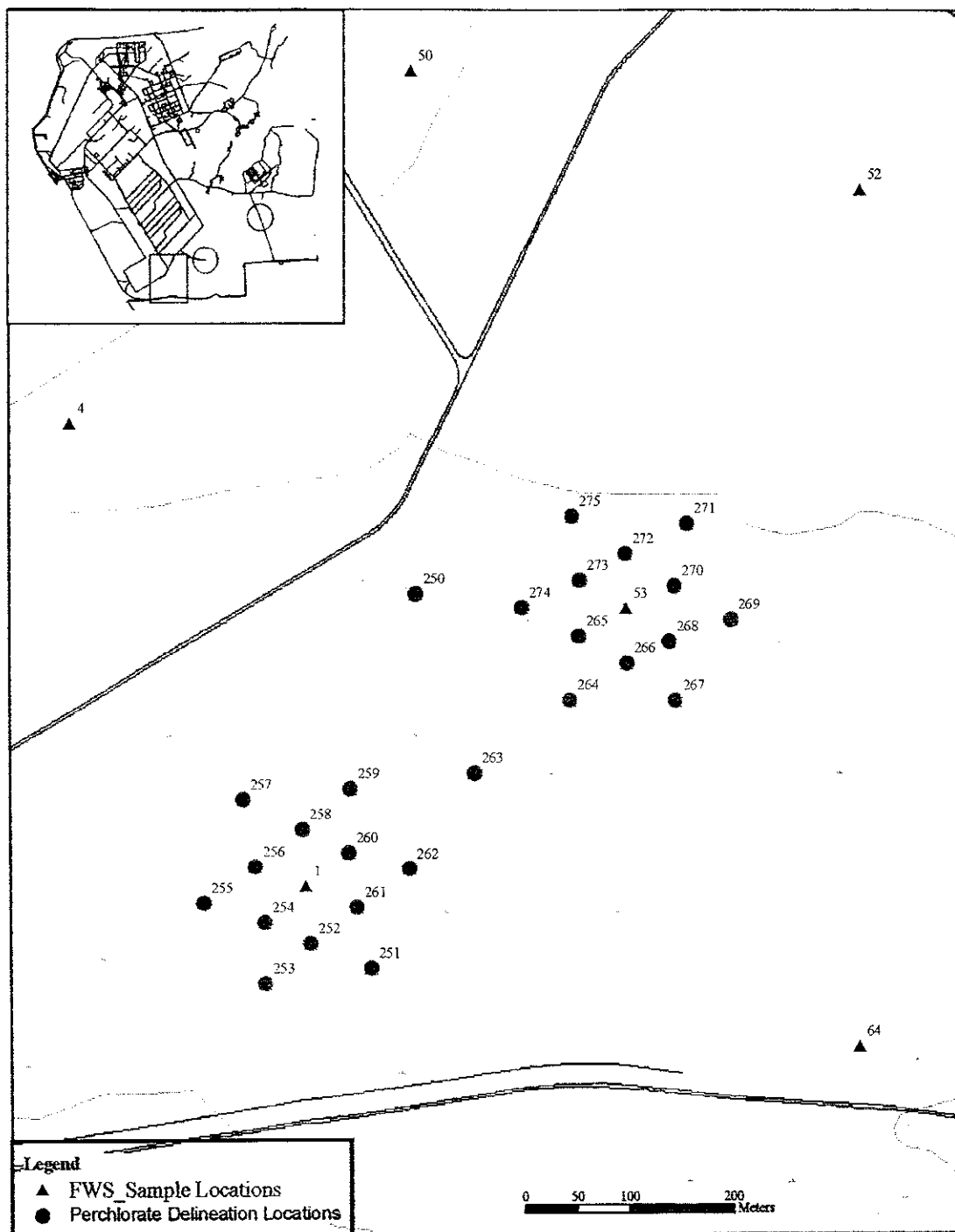


Figure 1. Surface Soil Sample Locations for Perchlorate Delineation Area



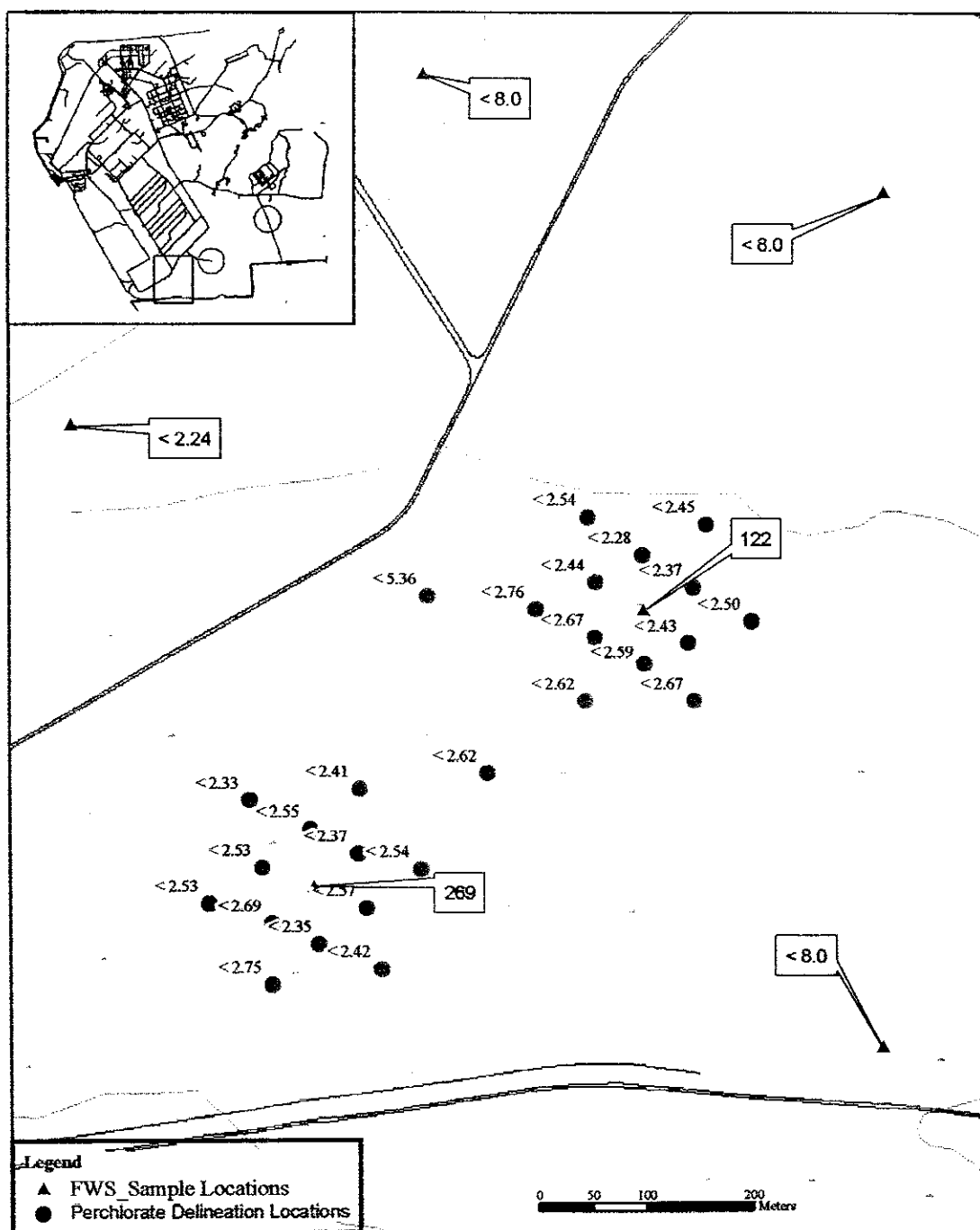


Figure 2. Perchlorate Results (ug/Kg)

14 June 2004

**Memorandum For: Cliff Murray, CESWT-EC-ER**

**Subject: Chemical Data Quality Assurance Report, Longhorn Army Ammunition Plant, February 2004  
Supplemental Surface Soil Investigation**

### **1.0 Introduction**

The US Army Corps of Engineers (USACE), Tulsa District conducted a supplemental surface soil investigation at the Longhorn Army Ammunition Plant located near Karnack, Texas in February 2004. The purpose of these activities was to collect shallow surface soil samples from 26 locations to define the horizontal extent of perchlorate contamination detected during earlier investigations. Soil samples were collected by hand with a disposable scoop at a depth of 0.0-0.5 feet bgs. Samples were containerized in 4 oz. wide-mouth glass jars and cooled. A minimal amount (<5 gallons) of investigative derived wastes were generated. These wastes were managed as non-hazardous and disposed of onsite.

The 25-26 February 2004 sampling event included the collection of 26 field samples and two quality control duplicate samples. Soil samples were analyzed for perchlorate and performed in accordance with current Environmental Protection Agency (EPA) protocols, i.e. SW846 method 8321A (modified). Previous perchlorate analyses were performed by EPA wastewater method 314. Method 8321A is a more sensitive method capable of reporting perchlorate results with greater confidence.

### **2.0 Analytical Data Evaluation**

Analytical laboratory services were awarded by the USACE to General Engineering Laboratories, Inc. (GEL) located in Charleston, South Carolina. Analytical services were awarded under contract No. DACA56-03-D-2007 (Task Order No. 0008). Analytical data for the February 2004 sampling event was organized in a single delivery group and referenced in GEL Report #04026 (February 3004). Soil samples were prepared and analyzed under batch No. 316903, 316904 and 316906, 316908, respectively. The following paragraphs detail method performance and quality control measures.

#### **2.1 Accuracy**

The laboratory control spike (LCS) and matrix spike (MS) recoveries fell within acceptable quality control limits. Adequate sample material was available to perform matrix spiking. Soil Sample "Caddo-PS-264" and "Caddo-PS-269" were selected for the MS.

#### **2.2 Precision**

Matrix Spike duplicate (MSD) recoveries fell within acceptable quality control limits. Relative percent differences (RPDs) fell within acceptable limits. Soil Sample "Caddo-PS-264" and "Caddo-PS-269" were selected for the MSD.

#### **2.3 Representativeness**

Quality control duplicate samples were collected and the results were determined to be in agreement. Perchlorate results for samples "Caddo-PS-262", "Caddo-PS-270", and the related quality control duplicate samples were all reported as non-detect.

Method blank data was collected and the results determined to be free of contamination

**2.4 Comparability**

No quality assurance duplicate samples were collected.

**2.5 Sensitivity**

All continuing calibration verification and low-level calibration verification data fell within acceptable and established criteria. All sample receiving criteria and holding time requirements for the soil samples were met.

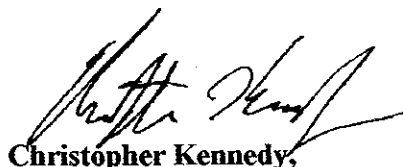
GEL noted that the interference check sample had to be re-extracted for sample batch 316908 due to low recoveries. The re-analysis was reported to meet all acceptance criteria.

**2.6 Completeness**

Upon reviewing the project work plan with regards to sample collection and analysis, a completeness of 100% was demonstrated.

**3.0 Conclusion**

A chemical data quality assurance report has been completed with regards to the supplemental surface soil investigation conducted at LHAAP. An evaluation of the analytical data indicates that the sample handling, shipment, and analytical procedures have been adequately completed and that the analytical results are considered to be accurate.



Christopher Kennedy,  
Senior Chemist, HTRW Design Center



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

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Dr. Rose Zeiler  
Longhorn AAP, Department of U.S. Army  
Box 3 – B1487 - Building 1440  
Ft. Chaffee, AR 72905

July 9, 2004

Dear Rose,

On July 8, 2004, Refuge Biologist Paul Bruckwicki, Refuge Forester John Stephens and I met with Forestry Technician Lanis Rieger to discuss forest management activities on Longhorn AAP. Lanis indicated that you and COE Forester Danny Kellam had asked questions concerning future timber sales and other activities on the base.

Lanis identified four areas that could be included in a timber sale for 2004-2005. The Magazine Area (Unit 31), the Elevated Water Storage Area (Unit 23), approximately 30 acre tract in Unit 8, and the area north of the fence on the north end of the Production Area (Unit 6). All the areas are outlined on the LHAAP Woodland Management Units Map attached (attachment 1). Unit 31 is scheduled to transfer before the end of the fiscal year (attachment 2). The opportunity to carryout forest management activities under the Army INRMP on Unit 31 would have a very small window indeed. I suggest we discuss management in areas where a timeline has not been established. Unit 23 is approximately 111 acres in size. According to Paul and Craig the area will probably not transfer before the end of FY 2005. A timber sale in this area would be satisfactory to our future management plans. Unit 23 will likely transfer before the Production Area. Accordingly, the timeline to re-enter the area for wildlife management purpose is different than the areas we harvested in the last two years. We recommend that the pine basal area be thinned to between 70 and 80 instead of 60 – 70. We'll be happy to discuss the details of why we recommend leaving slightly more stems/acre, but for the sake of this letter, we will say it's better for our overall wildlife management purposes. We request that John Stephens be allowed to assist Lanis with tree marking activities (for brief periods) and discuss where landing/loading sites by the loggers will be established. Unit 6 is approximately 31 acres in size. The site is inside the Production Area and will not transfer in the immediate future. We concur with Lanis' thoughts on thinning in Unit 6. Unit 8, as Lanis proposed, is approximately 30 acres in size. We have expanded the area east of the slough to 88 acres for discussion purposes.

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The area will probably transfer before the Production Area and we do have some concerns about tree species and stocking. We don't know exactly what the recommended wildlife habitat prescription will be for this area and we are reluctant to thin the area now.

We have included an approximately 80-acre tract east of the slough in Unit 9 for consideration, as well as the warehouse magazine area. We believe these sites are candidates for a timber sale: the 80-acre area in the future, and the Magazine Area this year.

To summarize, we suggest to include Unit 23, Unit 6 and the warehouse magazine area for timber sale in 2004-2005. The areas in Unit 8, Unit 9 and Unit 31 can be addressed in FY 2005-2006, if transfer does not occur (attachment 3). This is a total of approximately 150 acres to be considered for a timber sale in 2004-2005. These are recommendations you and Danny can discuss and we can agree on a course of action in the near future.

Other discussions were held regarding prescribed fire on LHAAP property. We have been in contact with the Texas Forest Service concerning control burns on the base. We have not had detailed discussion with them, but we would like to start the process. The Texas Forest Service (TFS) has stated that they would like to use the Base/Refuge as a training/test area for prescribed fire activities. Under the direction of Lanis and Danny, we would like to burn 866 acres on the base in 2004-2005. Attached are maps (attachment 4) our staff and Lanis put together for your review. If you concur with our request (or parts thereof) let me know and we will put a package together and talk with the TFS supervisor. If the 613-acre Magazine Area transfers on schedule, we will of course delete it from the proposal. Refuge staff may also be available to assist TFS with prescribed fire activities.

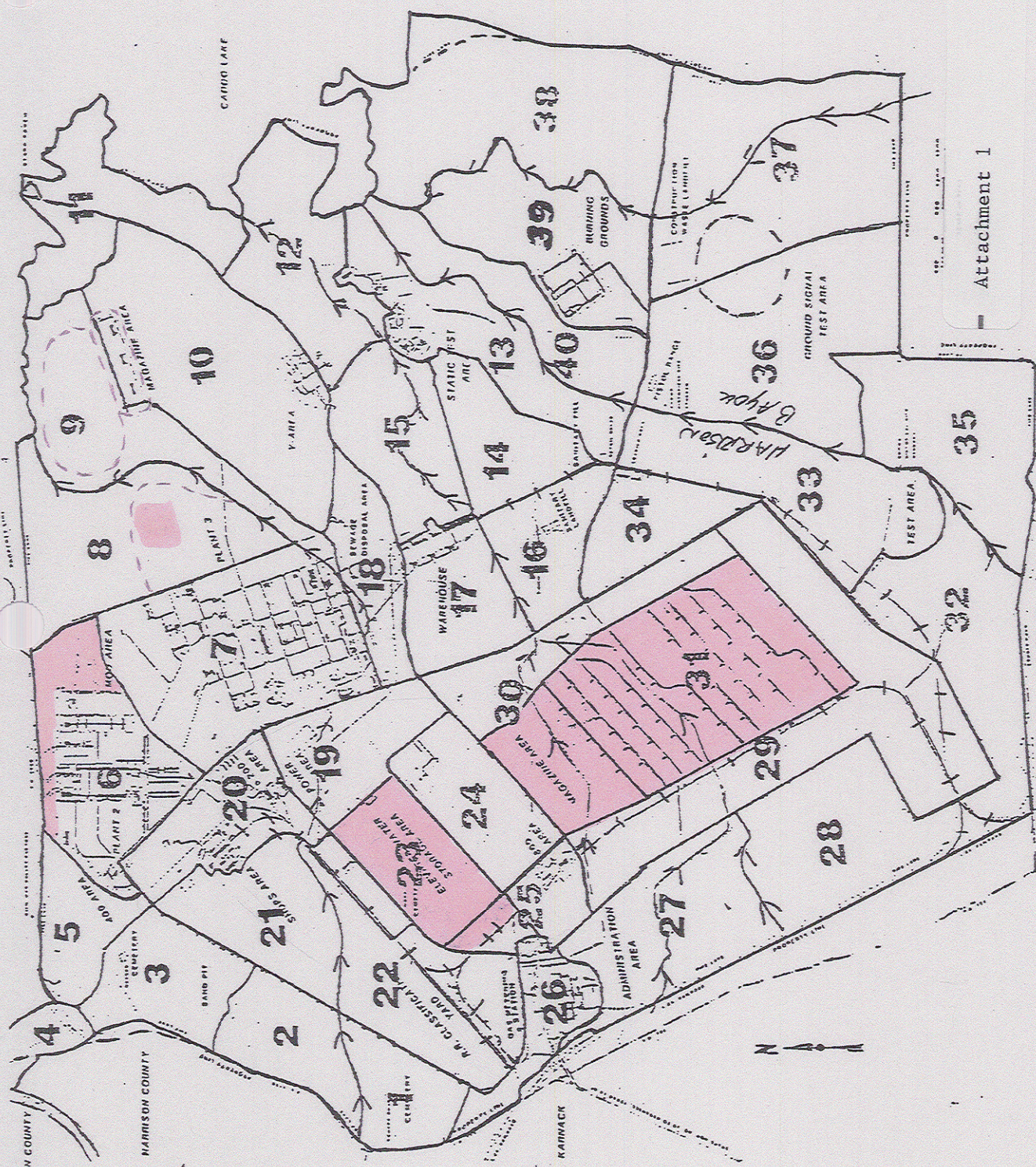
We would like to start the process on the timber harvest and prescribed fire proposals as soon as possible. Please let us know how you wish to proceed on these matters.

Sincerely,



Mark Williams





Attachment 1

# Longhorn Army Ammunition Plant

## Woodland Management Units

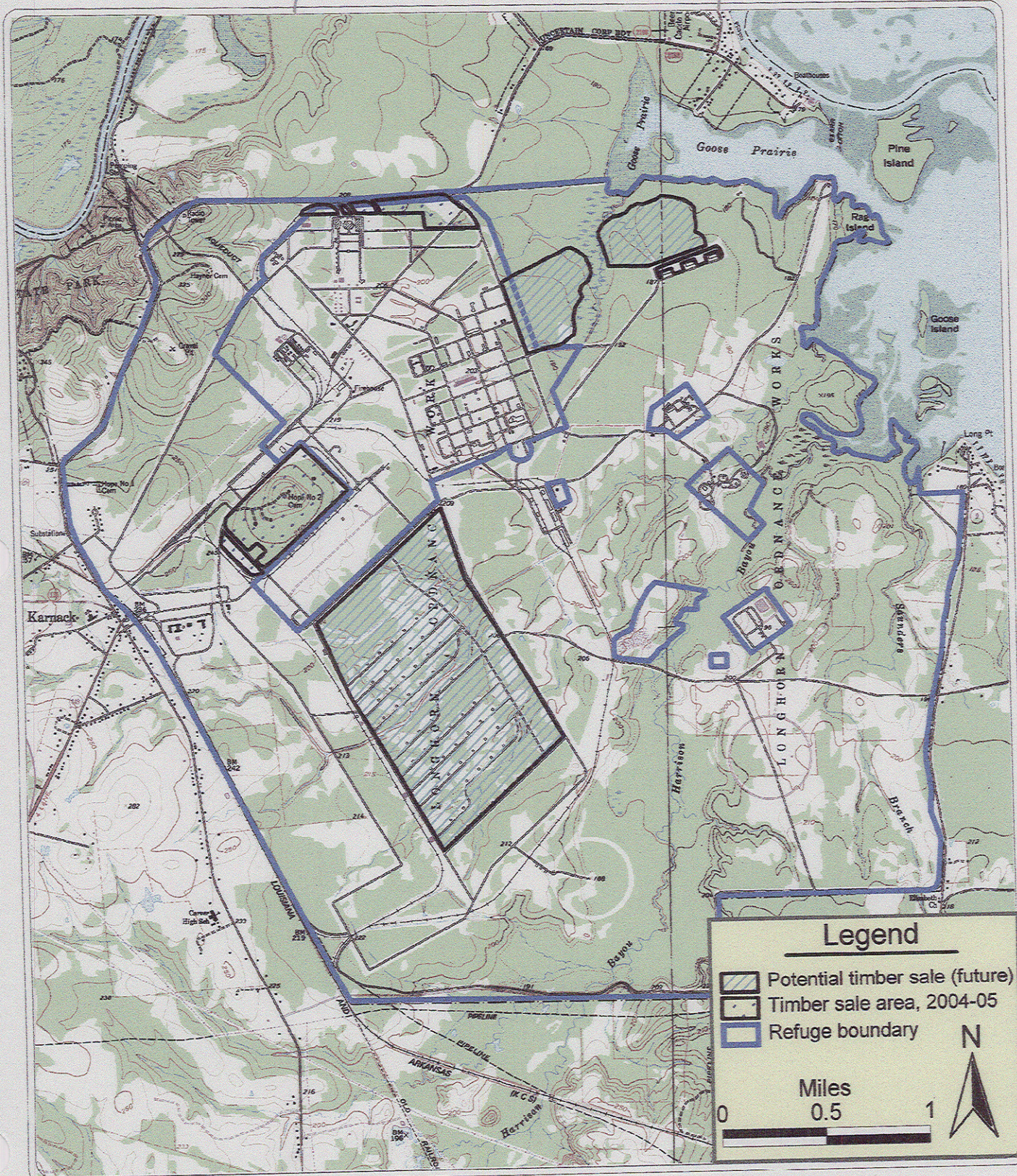




# Caddo Lake NWR

## Purposed Timber Harvest Map

Vicinity Map



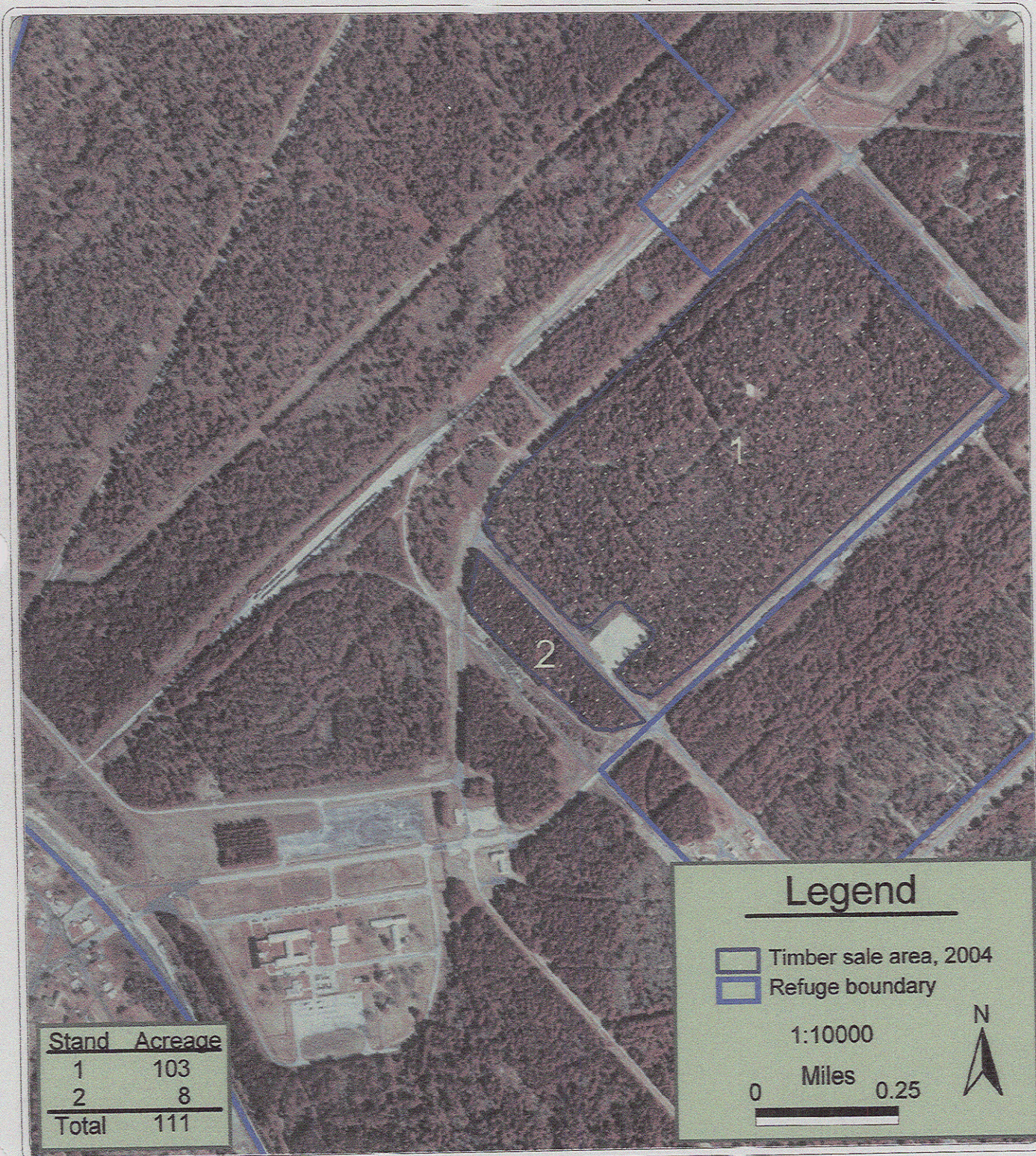




# Caddo Lake NWR

## Purposed Timber Harvest Map

Unit 23  
(Elevated water storage area)







# Caddo Lake NWR

## Purposed Timber Harvest Map

Unit 6 &  
(Warehouse magazine area)





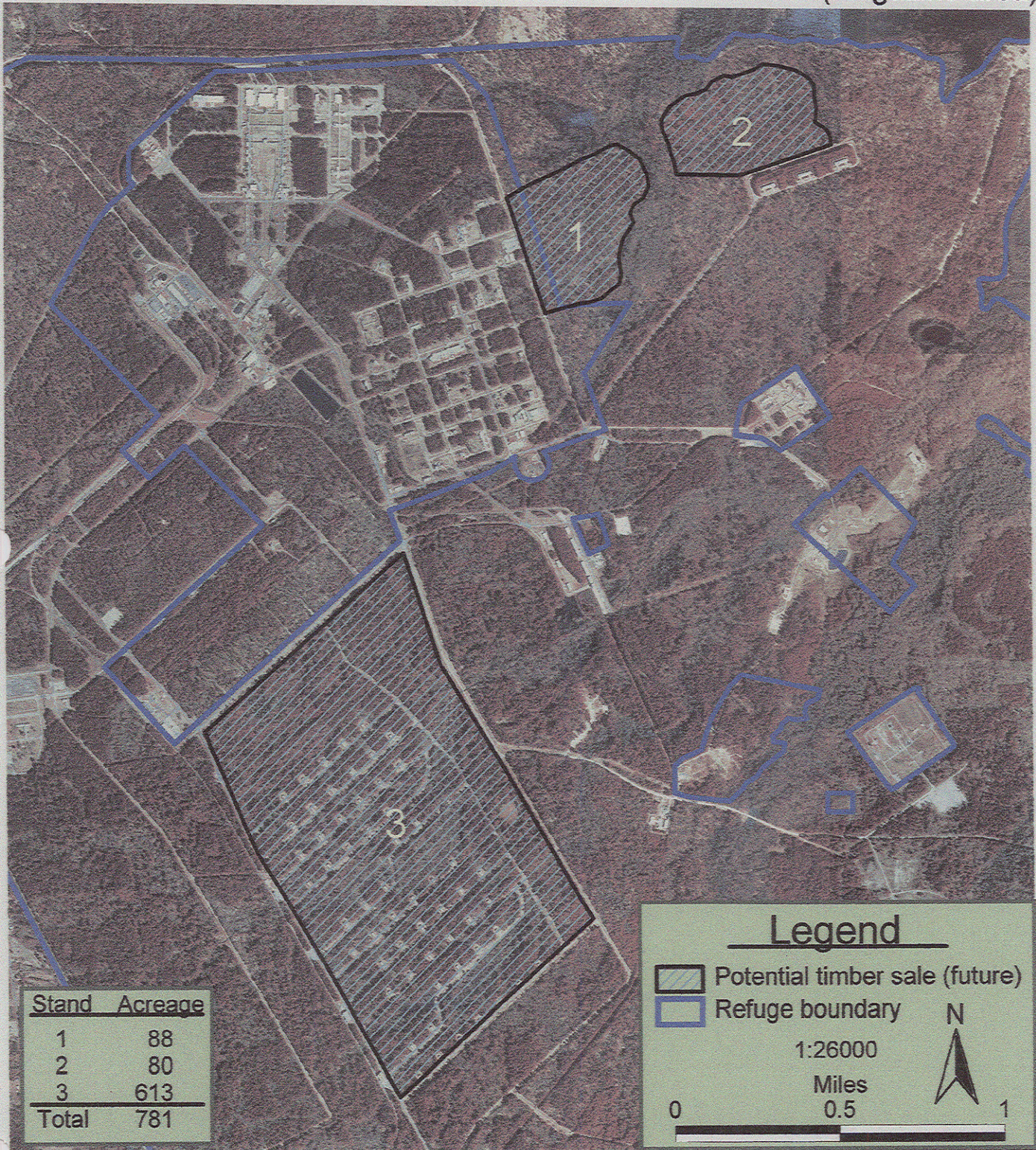


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# Caddo Lake NWR

## Purposed Timber Harvest Map

Unit 8-9 &  
Unit 30-31 (magazine area)



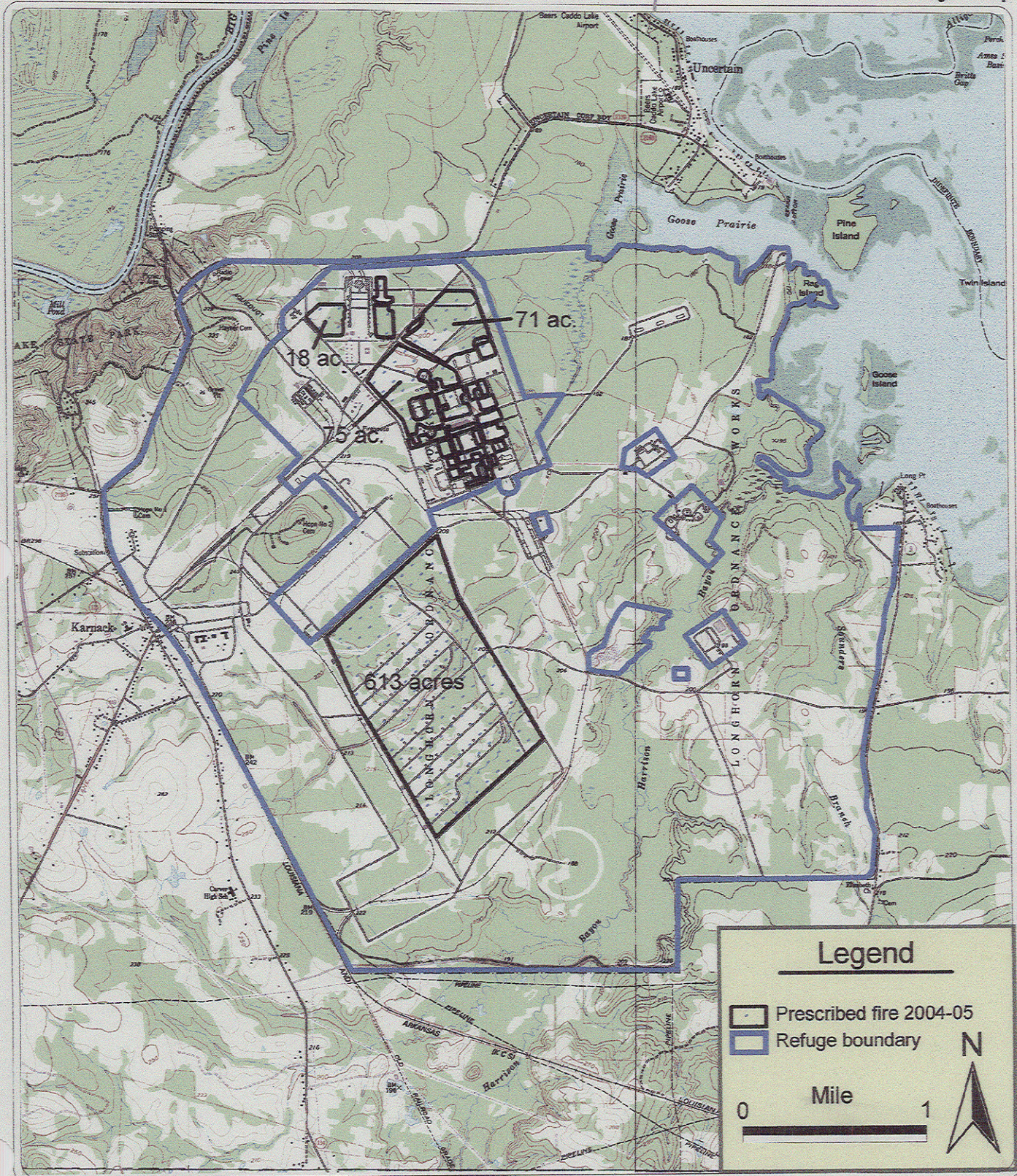




# Caddo Lake NWR

## Prescribed Fire Map

### Vicinity Map







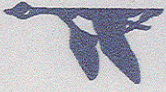
# Caddo Lake NWR

## Prescribed Fire Map

Production Area



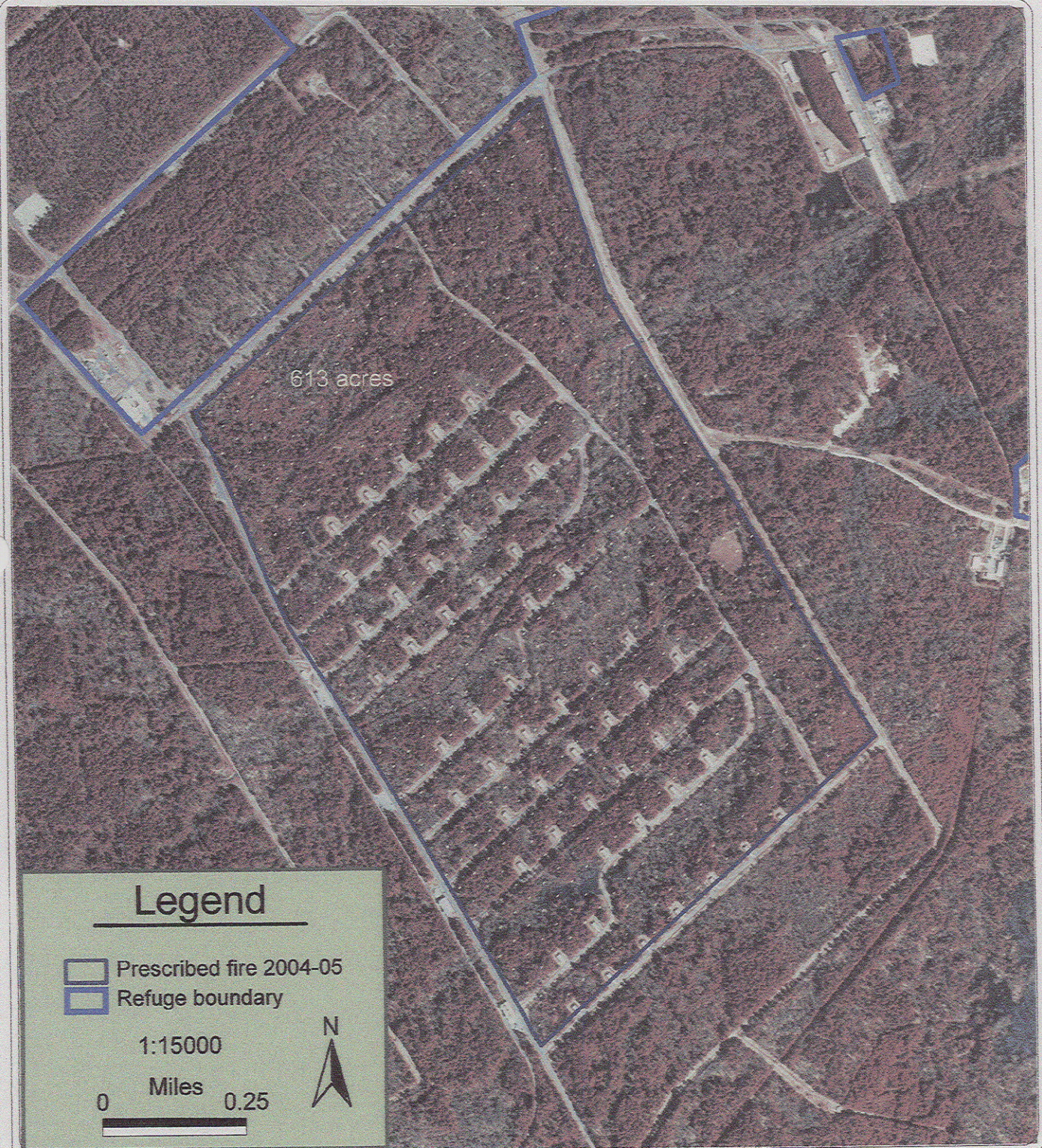




# Caddo Lake NWR

## Prescribed Fire Map

Magazine Area





| ID | AREA         | PERIMETER | ACRES   |
|----|--------------|-----------|---------|
| 1  | 3107008.927  | 7336.873  | 71.327  |
| 2  | 67767.817    | 1232.169  | 1.556   |
| 3  | 188692.276   | 1658.950  | 4.332   |
| 4  | 792482.801   | 3446.653  | 18.193  |
| 5  | 221008.111   | 2392.907  | 5.074   |
| 6  | 472208.880   | 2862.165  | 10.840  |
| 7  | 3294354.307  | 13122.716 | 75.628  |
| 8  | 587023.256   | 3761.074  | 13.476  |
| 9  | 108980.535   | 1463.306  | 2.502   |
| 10 | 83067.828    | 1211.107  | 1.907   |
| 11 | 161442.333   | 1564.493  | 3.706   |
| 12 | 213566.053   | 1942.508  | 4.903   |
| 13 | 264071.097   | 2143.334  | 6.062   |
| 14 | 239574.097   | 3268.272  | 5.500   |
| 15 | 122853.953   | 2128.640  | 2.820   |
| 16 | 150642.770   | 1489.100  | 3.458   |
| 17 | 84664.330    | 1241.244  | 1.944   |
| 18 | 77072.632    | 1213.312  | 1.769   |
| 19 | 53915.284    | 916.849   | 1.238   |
| 20 | 183000.830   | 2388.625  | 4.201   |
| 21 | 85259.932    | 1168.432  | 1.957   |
| 22 | 159967.936   | 2068.830  | 3.672   |
| 23 | 65311.721    | 1363.179  | 1.499   |
| 24 | 41843.238    | 853.786   | 0.961   |
| 25 | 47425.893    | 912.405   | 1.089   |
| 26 | 40207.556    | 858.735   | 0.923   |
| 27 | 91497.271    | 1238.507  | 2.100   |
| 28 | 26724973.405 | 21737.296 | 613.521 |

Total acres

866.158

Attachment 1